Mainstreaming Environment and
Sustainability in African Universities:

Stories of Change

Edited and supported by: Heila Lotz-Sisitka, Gitile Naituli,
Amanda Hlengwa, Mike Ward, Ayobami Salami, Akpezi Ogbuigwe,
Mahesh Pradhan, Marie Neeser and Sanne Lauriks

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Acknowledgements

Contents

Stars in the Night

- Akpezi Ogbuigwe -

It was Night Time
No one could dispute that.
The report was in
Our global challenges included:
Climate change
Loss of ecosystem services (including rapid coastal ecosystem degradation)
Threats to food security and water
Deforestation
Loss of biodiversity
Land and water degradation
Deterioration of fisheries
Waste management crises
Increasing poverty
Insecurity / wars
The Millennium Development Goals were at risk of not being met...
It seemed the sustainability dream was lost!
That was 2002 in Johannesburg.
The world had gathered again to review the sustainability scorecard and strategise for the future...

No one knew that that gathering was going to be like none other
It was going to give birth to a baby called The Decade of Education for Sustainable Development
What a mouthful but what a delightsome child!

Then inconspicuously, stars began to burst out of the night
In all continents you could see the stars in the night
Africa was not left out
The stars burst out in their zillions
From the United Nations office in Narobi
To Southern Africa, East Africa, West Africa, The Horn of Africa, Central Africa, North Africa
You could see the MESA stars decorating the night
Shooting out stars to the global community...

It's now 10 years, the stars are still replicating themselves

Let them shine forth in their host
Let them shine brighter and brighter
Let them fill the dark night
For no night remains night when overtaken by stars

Akpezi Ogbuigwe
November 2014

PART A: Orienting Papers

Chapter 1: Introducing the UNEP Mainstreaming Environment and Sustainability in African Universities Partnership Programme

Mahesh Pradhan, Brian M. Waswala-Olewe and Mariam Ayombi

(United Nations Environment Programme)

Abstract

The chapter provides an overview of the Mainstreaming Environment and Sustainability in African Universities Partnership (MESA). The partnership was established to strengthen capacity development and environmental innovation through practical education, training and networking in African universities through Education for Sustainable Development initiatives. The MESA partnership, supported by the United Nations Environment Programme (UNEP) since 2004, was developed via three phases over the period of the UN Decade on Education for Sustainable Development, culminating in this Monograph on 'Stories of Change', and the development of the Africa Environmental Education and Training Action Plan for 2015-2024. MESA universities have contributed to the development of this Action Plan, and also paved the way for the establishment of the Global Universities Partnership for Environment and Sustainability (GUPES), which now has 500 partner universities, including the 90 from the MESA network. This allows MESA universities to be linked into a global universities network focusing on the mainstreaming of environment and sustainability into universities.

Introduction

Africa faces a myriad of challenges that impact negatively on the environment (UNEP, 2002, 2006, 2012a). These challenges include: increased climate change vulnerability; desertification of arid areas; deforestation (massive land clearance for agriculture and fuelwood); rapid urbanisation (particularly in coastal areas and proliferation of informal settlements); decline of biological resources (habitat loss, overharvesting of selected resources, and illegal activities); degradation of coastal and marine habitats (pollution, overharvesting of resources, inappropriate development in the coastal zone, poor inland land management, and oil pollution); increased water scarcity and low quality (constrain food production, industrial activities, and contribute significantly to the burden of disease); widespread poverty; poor economic performance; trade policies that are not conducive towards peace and development; inadequate technology base to satisfy existing demand; increased civil strife; and growth in illegal trade in minerals and other natural resources.

Many of these challenges have complex roots and drivers, as is reported on in the African Environmental Outlook report, and are related also to inadequate environmental education as a driver for sustainable development and resilient ecosystems. In 2013, the Global Environmental Outlook Report of UNEP emphasized the importance of environmental education.

UNEP with active participation from United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations University (UNU) and the Association of African Universities (AAU), among other partners, established the Mainstreaming Environment and Sustainability in African Universities (MESA)

Partnership Programme in a bid to address these challenges, enhance environmental awareness capacity development in African tertiary education institutions (UNESCO, 1978) and escalate United Nations Environment Programme (UNEP) engagement through Environmental Education (EE) in African universities. The network of universities provides environmental awareness capacity development in African Higher Education Institutions (HEIs). The network of universities seeks not only to enhance the quality, policy, practice and relevance of university education in Africa in the context of environment and sustainable development, but also to support the UN Decade of Education for Sustainable Development (UNDESD, 2005-2014), and the achievement of the Millennium Development Goals (MDGs) and post-2015 Sustainable Development Goals (SDGs).

In so doing, MESA not only increases EE mainstreaming by harnessing the creativity, ethics and knowledge of Africa's youth and professionals, but also enhances their capacity to respond to new and longer-term challenges, instead of concentrating on immediate problems. The acquired understanding, skills and values enable them to participate as active and informed citizens in the development of an ecologically sustainable and socially just society. The network of African Universities also provides universities, civil society, communities and the private sector a platform for dialogue on sustainable development. It also furnishes participants with a range of innovative tools and strategies to implement Environmental Education innovations within their sphere of influence and in different university contexts.

MESA thrives on the creative and innovative capacity of youths and professionals, who share the vision of Environmental Education. By mainstreaming environmental and sustainability concerns into the teaching, research and community engagement curricula within African universities, the Partnership Programme also envisages achievement of sustainable development goals and aims to address the myriad of challenges in Africa. At present, Environmental Education is a critical component in the achievement of the UNDESD and the 2nd Decade of Education in Africa (2006-2015).

Moreover, MESA contributes to the work programme of the African Ministerial Conference on the Environment (AMCEN), which is an integral part of the Action Plan for the Environment Initiative of the New Partnership for Africa's Development (NEPAD, 2003). MESA also provides a response to the UNEP (2011) Green Economy Report and UNEP (2012b) Global Environment Outlook (GEO-5) Assessment Report, which call for mainstreaming capacity development, participation, and collaboration in education for sustainable development through information sharing, networking, technological transfer and innovations in formal and non-formal institutions.

MESA's goal and objectives

MESA's overall goal is "to promote integration of environment and sustainability concerns into teaching, research and community engagement and management of African universities, as well as to enhance student engagement and participation in sustainability activities both within and beyond universities" (UNEP, 2013).

To achieve this overall goal, the MESA partnership has developed five long-term objectives that seek to enhance the quality, policy, practice and relevance of university education in Africa in the context of environment and sustainable development. The five long-term objectives are:
- revitalising higher education systems in Africa by building competence to address 21st century science, technology, society and sustainable development challenges envisaged by the AU and NEPAD;
- building broad-based multi-disciplinary capacity for responding to environmental and sustainability issues in African universities and the broader education system that is influenced by universities;
- maximising the development opportunities provided by Africa's environment in a sustainable manner;

- enhancing the preparedness of African societies to respond to projected impacts of global climate change; and
- reversing negative environmental trends on the African continent.

Statistics

There are 55 countries with over 300 universities in Africa, employing over 150 000 academics who serve close to five million students. These universities are the peak organisations in the higher education system in Africa. At present, the MESA platform has a membership spanning over 85 universities in Africa in 30 countries, namely Angola, Botswana, Burundi, Cameroon, Congo, Côte d'Ivoire, Djibouti, Egypt, Ethiopia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe; and continues to grow rapidly (see Table 1 in Appendix). The network platform has eleven sub-regional partnerships or focal points (see Table 2 in Appendix and Figure 1 below).
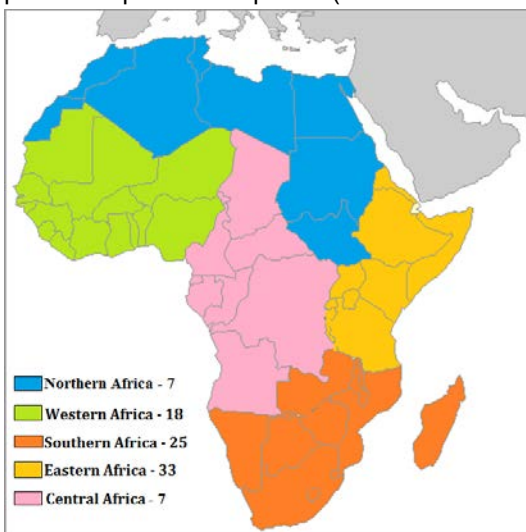
Figure 1: MESA sub-region member countries statistics (as of August 2014)

MESA pillars

The programmes, projects, activities and initiatives of MESA are guided by the three pillars of the Environmental Education and Training Unit (EETU) of UNEP namely: Education, Training and Networking.

Education pillar
The education pillar focuses on facilitating and informing higher education institutions to undertake curriculum innovations. This entails the following:

- organising regular seminars for students, university leaders and policy makers to report on and share ESD innovations associated with their respective universities;

- providing countries with new opportunities to incorporate ESD into education reform efforts;
- conceptualising and integrating MESA activities into the LEAD Network in Africa Programme Implementation of the Unit-Based Sustainability Assessment Tool;

- increasing capacity building and strengthening of the New Partnership for Africa's Development's (NEPAD) Environmental Action Plan[1] and the objectives of the African Ministerial Conference on the Environment's ESD initiatives;

- increasing contribution to the knowledge generation within UNEP's seven priority thematic areas and other contemporary environmental and sustainability issues, risks and challenges; and
- strengthening the voice of African students in ESD decision making.

Training pillar

The training pillar aims to develop applied competence by enhancing awareness and knowledge through the following initiatives:

- an Education for Sustainable Development (ESD) Innovation's Toolkit short course developed and implemented by partners[2]; and
- successful training of over forty-five African journalists on Millennium Development Goals and environmental reporting through the Environmental Reporting for African Journalists' Handbook[3] and Manuel de reportage environnemental à l'intention des journalistes Africains[4].

Networking pillar

The third pillar aims to strengthen and encourage regional higher education networks for environment and sustainability through the following initiatives:

- successful engagement in North-South dialogues and South-South dialogues; and
- established linkages with Regional Centres of Expertise (RCEs) in ESD in Africa.

MESA phases and achievements

Phase I (2004-2007)

A total of sixty-five universities from thirty-two countries in Africa were involved in the MESA Partnership Programme, representing 21% of Africa's public and private universities. This initial phase was guided by four key mechanisms, designed by university partners through a participatory approach. These include:

i) partnerships and networks;
ii) guideline resources;
iii) capacity building; and
iv) an awards framework.

This phase resulted in the following achievements:
- changes in curriculum and teaching practices of at least fifty university courses and their re-orientation towards sustainable development;
- the introduction of new courses and research programmes oriented towards environment and sustainability;
- the creation of a regional network of ninety academics, concerned with environment and sustainability, from sixty-five universities in thirty-two African countries;
- a partnership framework involving a total of fourteen supportive partners;

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[1] NEPAD Environmental Action Plan www.nepad.org/system/files/Environment%20Action%20Plan.pdf.
[2] Education for Sustainable Development (ESD) Innovation's Toolkit http://unep.org/Training/mesa/toolkit.asp.
[3] Environmental Reporting for African Journalists' Handbook www.unep.org/Training/docs/journ_hb.pdf.
[4] Manuel de reportage environnemental à l'intention des journalistes africains
http://unep.org/Training/docs/Manuel_de_Reportage_Environnemental_a_l%E2%80%99intention_Des_Journalistes_Africains.pdf

- professional development of participating lecturers, especially on environmental and sustainability issues;
- increased country level mobilisation involving national networks of universities and inter-country networking at sub-regional level;
- community level empowerment due to the new approach to teaching and research;
- increased engagement of universities with e-learning; and
- enhanced synergies of MESA with other UN and UNEP initiatives.

Phase II (2008-2010)

This phase emphasised additional capacity building initiatives, development of stronger systems-approaches and sub-regional networks. The focus was on strengthening local level innovations in universities and increasing exposure to regional links, capacity building opportunities, partnerships and resources.

The key outcomes of the second phase include:
- strengthened links between MESA and UNEP, allowing for greater exposure to and use of UNEP materials and resources;
- development of an International Training Programme (ITP)* on Education for Sustainable Development (ESD) in partnership with Swedish International Development Agency (SIDA), Ramboll Natura, three Swedish Universities and two African Universities;
- development of guideline resources and tools for assessing sustainability in universities and university policy systems and curriculum materials;
- extended partnerships at sub-regional level, allowing for more diverse MESA networks and activities;
- expansion of the United Nations University (UNU) Regional Centres of Expertise in Education for Sustainable Development in Africa linked to the MESA Universities Partnership; and
- advocacy engagements with universities on environment and sustainability through a university public lecture series.

> MESA, through its partnership with SIDA and NIRAS, has benefitted from a North-South knowledge exchange process through participation and development of an ITP on ESD for higher education in Africa. This has allowed MESA participants to learn from ESD knowledge and practices in a selected number of Swedish universities, and to undertake university exchanges in the African continent. Five annual programmes are undertaken. They include Education for Sustainable Development in Higher Education; Integrated Sustainable Coastal Development; Integrated Sustainable Coastal Development; Integrated Sustainable Coastal Development MENA; and Strategic Environmental Assessment.

Phase III (2011-2014)

In this phase, the MESA experience was scaled up to the global level through the Global University Partnership for Environment & Sustainability (GUPES). GUPES builds on the successes of Mainstreaming Environment and Sustainability in African Universities (MESA), the nascent Mainstreaming Environment and Sustainability in the Caribbean Universities (MESCA), and the Asia-Pacific Regional University Consortium (RUC). At present, over 500 universities from five different continents are part of the growing GUPES network.

Future objectives

In Africa, GUPES will continue MESA work that entails system-wide mainstreaming in universities, and providing capacity building opportunities as well as networking links and access to knowledge resources for mainstreaming through its initiatives. It is expected by the end of the phase that GUPES in Africa will contribute to the:

- revitalisation of higher education in Africa, contributing significantly to the 2nd Decade on Education in Africa (2006-2015) and post MDGs;
- establishment of a network of universities in each country in Africa that will foster student innovations and acquisition of relevant skills in the area of environmental sustainability aimed at ensuring sustainable local communities;

> In Africa, by the end of 2014, two green university functional networks of higher education institutions will be formed, one in Kenya and another in Morocco, which incorporate environment low carbon climate resilience development strategies and sustainability aspects in their education training, campus operations, management and student activities. The networks will help catalyse and raise profile of the need for more sustainable universities and the adoption of the Greening Universities Toolkit.

- establishment of more RCEs in Education for Sustainable Development across Africa;

- strengthening of teacher education system and support for African Francophone and Lusophone countries;

- knowledge enhancement within UNEP's seven priority thematic areas and other contemporary environmental and sustainability issues, risks and challenges;

- development and implementation of a climate change adaptation sourcebook in collaboration with Ghana University;

- promotion of Green Economy development opportunities, practices and technology in African Universities; and

- development of an African Environmental Education and Training (EE&T) Action Plan.

> The African Environmental Education and Training Action Plan
>
> The African Environmental Education and Training Action Plan (AEETAP) is a 10-year action plan that seeks to provide a framework for coordinated action on EE in all African countries. It intends to promote EE in Africa by directly building capacity for responding to environmental issues, risks and associated sustainable development challenges and securing the continent's post-Rio+20 strategy for sustainable development. Formulated as a direct response to Resolution 18 of the UNEP AMCEN Arusha 2012 Declaration, the action plan seeks "to strengthen environmental education and training and develop an action plan for Africa, covering formal and non-formal education, capacity-building and information networking components, among others, and to explicitly include a focus on technology-enhanced learning" (UNEP, 2012c, p. 18). Through the demonstration of good environmental practices, individuals, organisations and communities will address the rising environmental challenges ranging from neglect, degradation and poor environmental management. The Action Plan will also promote the employment of new technologies that would increase productivity, avoid environmental disasters, alleviate poverty, and promote green opportunities and wise decisions for a sustainable future. The Action Plan focuses on achieving five AMCEN Regional Flagship Programs namely: African Green Economy Partnership; Land degradation, Desertification, Biodiversity and Ecosystems based Adaptation; Partnership for Sustainable Consumption and Production (including integrated waste management); Africa Sustainable Energy Development Programme; and Africa Integrated Environmental Assessment for Sustainable Development.
>
> The AEETAP development is a participatory consultation process involving the MESA partnership program, United Nations Environment Program, Horn of Africa Regional Environmental Program, and Southern African Development Community Regional Environmental Education Program, among others, and will be adopted by the AMCEN for implementation between 2015 and 2025.

Conclusion

Universities are agents of change and have positively taken up their role in mainstreaming environment and sustainability in their curricula, research and community engagement activities. While much has been achieved in the university partnerships over the past ten years, a number of challenges continue to exist. Thus, there is need for an open ended creative movement for change worldwide. Sustaining this movement for change will require on-going participation from all partners, expanded networks, open communication systems and extended support from partners who can build capacity and knowledge and support systematic changes in universities. It will also require continuous information sharing, training and acting towards environmental sustainability within and outside universities in the world.

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APPENDIX

Table 1: MESA Countries and Universities

AFRICA	COUNTRY	UNIVERSITY
CENTRAL AFRICA	Angola	Universidad de Lusiada of Angola
	Cameroon	University of Buea
		University of Dschang
		University of Yaoundé
		University of Yaoundé II
	Congo	University of Kinshasa
		University of Kisangani
EASTERN AFRICA	Burundi	Université du Burundi
		Université de Ngozi
	Djibouti	University of Djibouti
	Ethiopia	Addis Ababa University
		Bahir Dar University
		Mekelle University
		Wolle University
		University of Gondar
	Kenya	Aga Khan University
		Catholic University
		Daystar University
		Egerton University
		University of Eldoret
		Jomo Kenyatta University of Agriculture and Technology
		Kenyatta University
		Technical University of Kenya
		Masinde Muliro University
		Maseno University
		Mount Kenya University
		Multi Media University College of Kenya
		Oshwal College

		Strathmore University
	Rwanda	Kigali Institute of Science and Technology (KIST)
		National University of Rwanda
	Tanzania	Mzumbe University
		St. Augustine University of Tanzania
		University of Zanzibar
		Cavendish University
	Uganda	Makerere University
		Mbarara University of Science and Technology
		Uganda Martyrs University
		Uganda Pentecostal University
NORTHERN AFRICA	Egypt	Cairo University
		Suez Canal University
	Morocco	Cadi Ayyad University
		University Hassan 1st
	Sudan	Sudan National Academy
		Omdurman Ahlia University
		University of Juba
SOUTHERN AFRICA	Botswana	University of Botswana
	Lesotho	Lesotho Agricultural College
		National University of Lesotho
	Madagascar	University of Antananarivo
	Malawi	Lilongwe University of Agriculture and Natural Resources
		Chancellor College
		University of Malawi
	Mauritius	University of Mauritius
	Mozambique	Universidade Eduardo Mondlane
	Namibia	International University of Management
		University of Namibia
	Seychelles	University of Seychelles
	South Africa	Nelson Mandela Metropolitan University
		Rhodes University

		University of Cape Town
14		University of Pretoria
		University of South Africa
		University of the Western Cape
		Vaal University of Technology
	Swaziland	University of Swaziland
	Zambia	University of Zambia
	Zimbabwe	African University
		Mlezu College of Agriculture
		University of Zimbabwe
		Zimbabwe Open University
WESTERN AFRICA	Cote d'Ivoire	Université d'Abobo-Adjame
	Ghana	Kwame Nkrumah College of Science and Technology
		University of Education
		University of Ghana
	Liberia	Cuttington University
		Salem University
		Stella Maris Polytechnic
		United Methodist University
		University of Liberia
	Nigeria	Bayero University
		Delta State University
		Federal College of Education
		Obafemi Awolowo University Ile-Ife
		Rivers State University of Science and Technology, Port Harcourt
		University of Agriculture
		University of Ilorin
		University of Ibadan
	Senegal	Université Cheikh Anta Diop (UCAD)

Table 2: MESA Sub-Regional Partners / Focal Points

CENTRAL AFRICA	Congo	The National Centre of Information about the Environment (CNIE), The Ministry of Environment, Nature Conservation and Tourism (MECNT)
EASTERN AFRICA	Ethiopia	Horn of Africa-Regional Environmental Centre and Network (HoA-REC&N)
	Kenya	Hanss Seidel Foundation, Nairobi, Kenya
		Industrial Ecology Institute
		Kenya School of Government
		National Environment Management Authority (NEMA)
	Uganda	Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)
SOUTHERN AFRICA	Mauritius	Mauritius Institute of Education
	South Africa	Leadership for Africa (LFA)
		SADC- Regional Environmental Education Programme (REEP)
WESTERN AFRICA	Ghana	Association of African Universities (AAU)

Chapter 2: 'Seeding Change': Developing a Change-Oriented Model For Professional Learning And ESD In Higher Education Institutions In Africa

Heila Lotz-Sisitka, Adesuwa Vanessa Agbedahin, and Amanda Hlengwa

(Rhodes University, South Africa)

Abstract

This paper responds to a problem in much higher education for sustainable development policy that proposes transformation towards sustainability in Higher Education Institutions, but fails to theorise *how* such transformations are to occur. It draws on our on experience of initiating and supporting over 81 'Change Projects' of various types (curriculum, management, policy, research and community outreach) that were developed in 66 Higher Education Institutions in 25 countries in Africa over a six year period via a change-oriented learning process initiated and supported by the International Training Programme on Education for Sustainable Development in Higher Education (ITP ESD-HE) which is an affiliated initiative of the UNEP Mainstreaming Environment and Sustainability in African Universities Programme. The paper provides an introduction to the ITP and how it is structured (i.e. how the change-oriented learning model works in practice) and goes on to discuss the morphogenic theory of change influencing the open process, yet reflexive and situated learning programme development, and the monitoring and reporting on the programme outcomes. We show how we undertook two types of analysis of change projects: descriptive and morphogenic analysis to describe the change processes taking place. We were particularly interested in *how* the change processes take place, and what the enabling and/or constraining factors are that shape changes towards sustainability in Higher Education. We found that change in HEIs towards sustainability involves a mix of structural, cultural and personal emergent properties that interact differently in different institutional and social contexts to produce diverse change oriented learning and practice results, some with high levels of institutional and external impact. All show impact at the level of improved knowledge and professional development, and changed practice in own sphere of influence. Many also show longevity and ongoing expansion over time. We propose therefore that change oriented learning processes can effectively 'seed change' towards sustainability in HEIs, even in difficult circumstances such as those experienced by many universities in Africa.

Brief background and problem statement

The past 30 years have seen a strong movement towards re-orienting Higher Education towards sustainable development. For example the UNESCO (2014) report on the UN Decade on Education for Sustainable Development reports that:

> HEIs have long been early adopters of the challenge of sustainable development, voicing their commitment to a more sustainable world in the 1990 Talloires Declaration, one of the first efforts to define and promote sustainability in post-secondary education around the world (Huppé et al., 2013). HEI commitments have centered on several major responsibilities: to prepare students for the future; to seek understanding of causes of global challenges and find solutions; and to demonstrate excellence in sustainable development practices through good governance, community relations and the management of the institution's environmental footprint. A growing number of HEIs are putting

sustainability plans in place, many of which reflect the characteristics of whole-institution approaches considering curriculum, teaching and research issues, in addition to greening operations. … The last 10 years have seen a sharpening of agendas and greater clarity on the scale and the drivers of changes required for higher education to reorient itself towards sustainability (Tilbury, 2014, cited in UNESCO, 2014, p. 113).

Much is said in international documents about the need to change curriculum, management and other practices towards sustainability in Higher Education. For example, the Rio+20 Treaty Principles, Commitments and Actions suggest that universities should "be transformative", and for this to be the case "higher education must transform itself". The Treaty recognises that this a 'challenge', and that this principle (#1) is perhaps the most important of all of the Treaty Principles.

Most interesting in all of the change and transformation discourse associated with the move towards more sustainable universities and societies, is the fact that very little is said about *how* such changes occur, beyond numerous case study examples which model specific changes in specific contexts. What appears to be lacking is a process of systematically theorising change, and developing praxis oriented **models of change** that can be used to fast-track and support ongoing transformation of higher education programmes and practices. This paper addresses this problem, and shares the thinking and praxis that has been developed in the UNEP MESA programme for facilitating change oriented learning and professional development of university academics and professionals who ultimately have the responsibility to transform higher education towards sustainability, at all levels of the institution and in a variety of responsibility areas: management, research, teaching and community engagement. In particular, the paper examines how an international professional development training programme (International Training Programme) on Education for Sustainable Development in Higher Education (ESD-HE) has been developed in association with the MESA programme to facilitate such change. The ITP on ESD-HE was developed in a partnership framework between UNEP MESA, NIRAS (a Swedish company involved in ESD), Rhodes University (in South Africa) and Tonji University (in China). This paper focuses only on the Africa component, and the change projects produced by participants from universities in Africa. Since 2008 a total of 139 change projects were produced by 280 participants from 106 institutions in 35 countries. In Africa 81 change projects were produced by 162 participants from 66 Higher Education Institutions in 23 countries (see Appendix A). In Asia 58 change projects were produced by 118 participants from 39 institutions in 12 countries (NIRAS, 2015).

A change oriented learning model in the ITP in ESD for Higher Education

The ITP in ESD-HE programme, has, since its inception, drawn on a **change-oriented learning approach to professional learning and institutional development** first developed at Rhodes University in the early 1990's for guiding Environmental Education professional development programmes (Lotz, 1999), and later refined and expanded via the MESA ESD Innovations Programme (UNEP, 2006) and the ITP ESD-HE (NIRAS, 2015). The expanded and refined model for professional development used in the MESA / ITP ESD-HE involves phases of professional interaction, learning and engagement that allow for 1) conceptualisation of change initiatives in HEIs; 2) international learning and exchange; 3) supported change process implementation; 4) regional knowledge exchange and learning; 5) supported and applied implementation of change initiatives (Lotz-Sistika & Hlengwa, 2013). The framework for the programme is represented in Figure 1 below, and is based on a reflexive model of professional development and learning, which in turn draws on a morphogenic theory of change outlined in the next section (Archer, 1995).
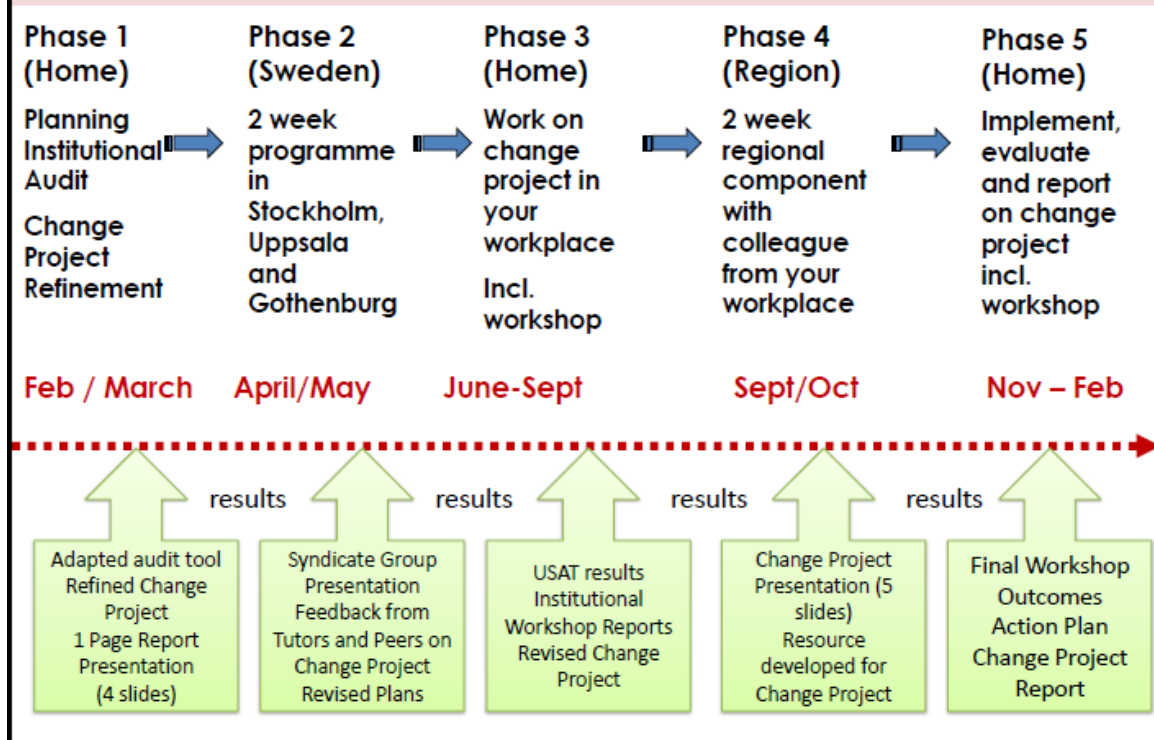
Figure 1: Change-oriented learning structure of the ITP ESD-HE

Since its inception in 2004, the MESA programme has supported over 90 ESD change projects in African universities. A key contributor to these was the professional development learning and change projects that were supported via the ITP in ESD-HE since 2008 via through the professional development process outlined above. As can be seen above, the phasing of the ITP in ESD-HE programme provides both collective and individual professional support to participants throughout the programme cycle, with particular emphasis on encouraging participants to self-define, contextualize and further develop an ESD 'Change Project' in their particular HEI working environment. This can be as a lecturer in a Department or Faculty, a dean or HOD leading a department or Faculty, or a university manager. No matter what the self-defined focus is, the support for engagement with a Change Project is designed to facilitate applied learning, and to potentially ensure that professional development of individuals also leads to institutional impact (this is not a 'pre-determined given', but is an emergent process dependent on many factors – see below. It cannot be 'forced' but can be encouraged via ongoing professional learning and reflexivity).

In **phase 1** (Preparatory pre-course phase) the following processes take place:
1. Recruitment of participants (participant and co-participant) and institutional approval for their proposed change initiative forming part of the application
2. A two-step approach to selection based on individual and organizational commitment;
3. Via mentor support and orientation materials, initial development of draft Project for Change with institutional support and support from course co-ordinators; involving also a face-to-face meeting / discussion seminar with head of organization to discuss Change Project
4. Results of this phase are prepared for presentation in Sweden.

In **phase 2** (Swedish course) the following processes take place:

1. Exposure to ESD in Sweden via three university programmes at Stockholm University's Resilience Institute (SD knowledge); Uppsala University (curriculum and learning), and Chalmers University (ESD and Whole Campus); and special sessions on learning and change management.
2. Presentations, discussions and peer review of change projects and change project plans
3. Participants develop detailed Implementation Plan for Project for Change, supported in particular by course activities and materials

In **phase 3** (Intermediate Consolidation Phase) the following processes take place:

1. Adjustments of Implementation Plan together with institutional colleague / fellow participant, as well as renewed commitment, input and support from superiors.
2. Preparations and data collection for phase 4 involving continued support to Project for Change from mentors through web-based support, dialogue facilities and site-based visitations that often take the form of 'institutional workshops' and/or round table meetings.

In **phase 4** (scheduled Regional Programme in South Africa or China) the following processes take place:

1. The teams of two participants from each organisation complete tools for project implementation
2. Support for this is provided through regional mentors feedback; peer reviewing; and additional input from regional case studies and ESD approaches that are available at the host institution.
3. Past course participants are also invited to share their change project outcomes where possible.

In **phase 5** (continued support for implementation phase) the following processes take place:

1. Implementation of Project for Change with e-mail and web based support from mentors;
2. Monitoring and Evaluation process;
3. 2nd round of implementation after revisions based on evaluation and feed-back
4. Second visit by programme coordinators to respective institution / country to contribute to institutional workshops where Change Projects are presented to wider constituencies in the HE institutions.

At **the end of each programme cycle**, the co-ordination team review outcomes and processes, with a view to:
1. Informing the following year's selection process to ensure potential for synergy effects with previous participants' achievements where possible and linkages into the networks supporting the ESD-HE ITP
2. Facilitating participants' design and implementation of Projects for Change in ways that build upon achievements from previous Projects for Change where appropriate.
3. Facilitate critical mass and international connections (via conference and other opportunities offered by UNEP partnership)

Theorising Change Processes in the ITP ESD-HE

Via our ongoing exploration of, and iterative reflections on, and theorizing of the change processes that we have observed occurring in the ESD-HE ITP based on the model and process outlined above, we propose that change *in all areas of university practice* can be pro-actively supported in ways that are *situated, reflexive and emergent* (see below) in and through professional development programmes involving academics in social networks, communities of practice and professional development processes that are oriented towards such social learning and change.

Such a model of change recognises that change is structured by pre-conditions not of an agents own making, but that all agents in Higher Education Institutions *have* capacity to mobilise social networks and social

processes to bring about change, if supported to do so in professional learning environments. Such changes need to be conceptualised *in relation to* structural constraints that are real and that exist, as well as and in dialectical relation to visions and possibilities for change. If done in this manner, this often leads to significant social and institutional changes over time. In explaining this model, Archer (1995) suggests too that time is an important factor, and that structural conditions always preceded social interactions at T1 (Time 1), and it is via social interactions at T2 (time 2) that change may occur in relation to the structural conditions that were established at T1. This may lead to new or refined or reconstructed structural conditions at a time after the social interactions: T3-T4 (time 3 to time 4). This process as applied in the ITP ESD-HE is outlined below in Figure 2.

Such a model of change should take account of a) positions and how these pre-date practices, and b) practices and how these can be shaped and changed by agents in diverse circumstances. It does not propose a 'one size fits all' outcome, but rather supports a diversity of change oriented practices to emerge over time, spiralling outwards into communities of practice, networks of change and resulting in changed practices. Such a model of change recognises underlying mechanisms and structures that shape what is possible, but also the power of individual and collective agents and how change can be effected in open systems.
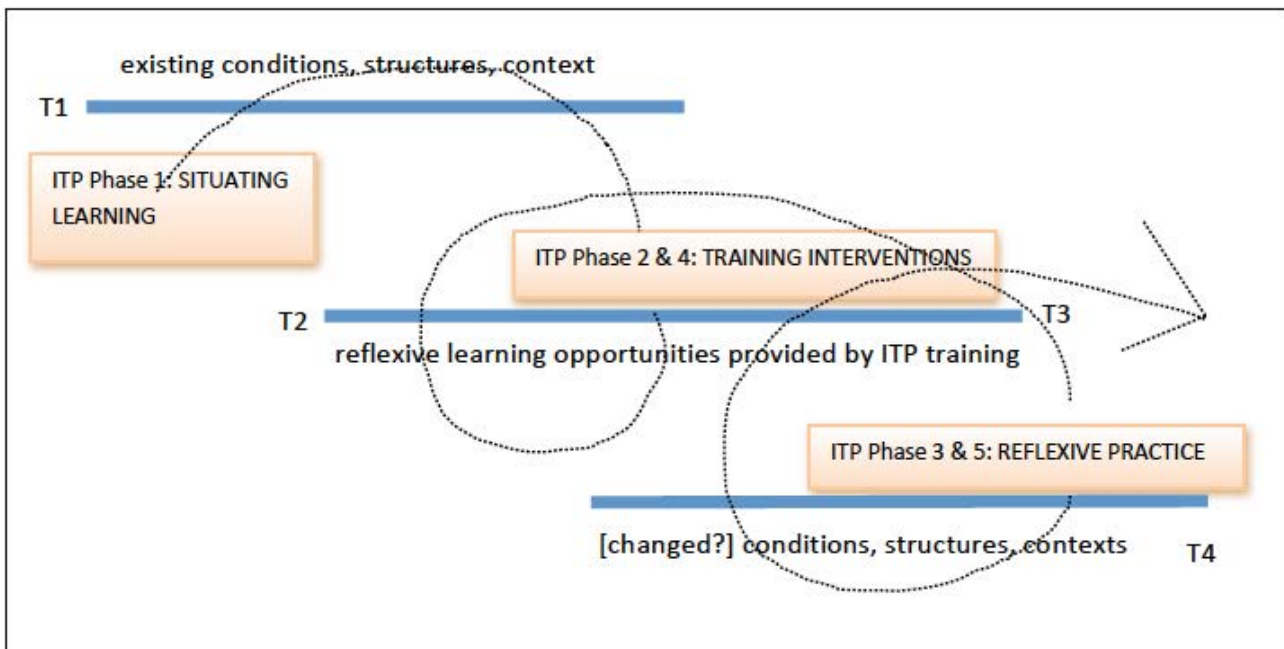
Figure 2: Change oriented learning model showing relationship between existing structures and conditions (where learning is situated), how learning interactions provided by the ITP engage from here, and how learning enhances reflexive practice back in context, potentially leading to changed conditions, structures and contexts **over time (T1-T4)** (adapted from Archer's 1995 model of social change) (Lotz-Sisitka & Hlengwa, 2012)

The learning programme of the ITP ESD-HE is based on a theory of learning and change. It is:
- **Situated** in that it a) expects participants to conduct institutional audits and consult with colleagues in their institutional contexts on potential arenas for where sustainability thinking can enhance changes in practice, and to use this as basis for their ongoing engagement within the programme; b) report on progress in their contexts of practice; and c) undertake actual change actions that contribute to a changed area of practice (self / institution directed).
- **Emergent** in that it supports the emergence of new, improved and changed practice towards sustainability through a) exposing participants to new theoretical ideas and concepts (e.g. sustainable development; planetary boundaries; social-ecological resilience; ethics-oriented learning; and b) exposing participants to relevant international experiences in the field of ESD in Higher Education

which serve as potential 'models' or examples of change that can be considered in relation to own context and practice.

- **Reflexive** in that it supports participants to reflexively review and report on changes in practice over a period of time; with international and regional mentoring support; and location of changes in practice within an institutional team.

The model of learning and change, on which the programme is based, draws on learning theory in the field of environment and sustainability education (social, situated learning theory); and morphogenic (change oriented) social theory (see Figure 1). This theory provides a language of description for explaining how change emerges from structure, via social interaction and reflexive deliberations; potentially manifesting in new practices through a process of supported reflexive practice. Key here is the understanding that agency is preceded by, but not fully determined by structures; and enhanced reflexivity can strengthen agency (abilities to act and bring about changes in practice) as outlined above.

Observing, documenting and analysing change processes in the ITP on ESD-HE

Analysis of the change processes in this programme took the form of a two stage process. Firstly it was important to provide a **descriptive analysis** through which we were able to document and capture key insights into the context of the individual professionals who were participating in the programme, as well as the contextual dynamics surrounding their ESD practices in their universities and/or communities. Following this, it was necessary to document the engagement and experience of the professionals in the ITP programme, and how they had 'taken up' and developed the proposed change project, who they had consulted, worked with, and what the outcomes and/or results of the change project were in their institutional contexts. This descriptive analysis took place over a period of a year, and in the six years that we were involved in the ITP ESD-HE programme, we documented 81 change projects from Africa in this way. The descriptive analysis of change projects was compiled via examining assignments and reports from participants, and also via observations during training programme sessions, and via observations and interactions during site visits to the universities concerned. Additional data was also obtained from an alumni results seminar held in the final year of the programme (2014; see Agbedahin & Lotz-Sisitka, 2015) and from insights gained from the final results report on the programme where all change projects were analysed for trends and changes (NIRAS, 2015).

From here, the change projects were categorized into 'types of change project', and over the range of 81 change projects we were able to observe changes in the following areas of Higher Education Practice:

A: New policies and management strategies
B: New management practices
C: New tools and methods
D: New courses and programmes
E: New structures and networks (see Appendix A for the full list of such changes supported by the ITP ESD-HE in Africa[5], see also NIRAS, 2015)

Two examples of analysis are included below – Table 1 shows an example of an initial **descriptive analysis,** and Table 2 shows an example of a **morphogenic analysis** of a change project.

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[5] Note that this process has also been applied in Asia, with a similar list of ESD change processes emerging in Asian Universities (NIRAS, 2015).

Table 1: Example of initial capturing and description of a change project based on all data sources

E.g. Change Project Example from the Catholic University of Mozambique

Country	Mozambique
Organisation	Catholic University of Mozambique
Participants	XXXXX (Co-ordinator of the Regional Planning and Geographical Information Systems Programmes in the Faculty of Economics and Management) & XXXXX (Pedagogical Director in the Faculty of Economics and Management).
Type of Change Project	**Curriculum Innovation:** Under-graduate and post-graduate (with emphasis on the latter)
Title of Change Project	Integration of ESD into courses in the Faculty of Economics and Management; and re-development of courses for two Masters Programmes in the same faculty
Contextual information and starting points	The Catholic University of Mozambique is a private university, with around 8000 students. It has eight different faculties including: Agriculture, Health Sciences, Social Sciences and Politics, Law, Economics and Management, Education and Communication, Engineering and Tourism Management and Information systems. The university is based in Beira but has faculties located elsewhere. Three faculties are located in Beira, a fast growing city which is located in an estuarine area. Beira is a key 'port' city for Mozambique and the city has developed mainly around the port, although there is also fishing industry activity and tourism activities in the city. As is the case with all universities in Mozambique, the university is currently undergoing expansion and new facilities are being built for lecturing and for library development. The Faculty is run by a Director / Dean. Each faculty also has its own Pedagogical Director who oversees the curriculum and teaching and learning programmes in the Faculty. The Faculty is starting to develop a stronger research profile, and a directorate of research exists, in which an international technical assistance programme for climate change adaptation and sustainable development exists, funded by GIZ. This programme has helped to support the intentions of this faculty-based change project (see report below).
Change project process and outcomes	<u>Starting out:</u> The change project initially was intended to facilitate mainstreaming of ESD into all three of the Beira Faculties. The lead participant, however, is based in the Faculty of Economics and Management, and after initial discussions it was decided to focus the curriculum innovation initiative in the Faculty in the first instance, and later expand to the other faculties. Initially, there were also plans to develop a transversal programme on Sustainability Theory and Practice. Following various interactive processes (see below), this decision was changed, leading to the eventual outcomes of the Change Project. <u>Main outcomes:</u> A number of internal consultations were hosted on the change project. As indicated above, initially the plan was to do ESD mainstreaming across three faculties. However after initial internal consultations it was decided that it would be better to establish the innovation in one faculty first, and then expand to other faculties. A second round of discussions took place on the concept of developing a 'transversal course' on Sustainability Theory and Practice to lay the foundation for other sustainability courses, but it was decided that due to the fact that the current degree programmes are only three years long, and that they are already 'full' this would not be a good solution as it would be too difficult to 'fit in' the transversal course as there are already other transversal courses (e.g. Social Ethics) that are in place. However, there is a process currently underway to expand the three year degree into a four year honors degree, in which case there is room for further ESD curriculum innovation. A number of the course co-ordinators (e.g. from the Management programme) are planning to introduce ESD curriculum innovations into the new four year degree programme. Following these deliberations it was then decided that the Change Project should focus on training of staff to integrate ESD issues into their courses. This has had a good outcome, and five new modules are in development: Sustainability Theory and Practice, Environmental Politics, Public Waste Management, Environmental Economics, and Climate Change Adaptation and Disaster Risk Reduction. Materials and course frameworks have already been developed for three of these courses. Of interest is the fact that initially the GIZ programme located in the research directorate was interested in developing climate change courses, but through the interactions via the Change Project discussions and training

	it was decided that more basic environmental courses should be in place first, to ensure that climate change course development would have a good foundation. In addition to the courses above, there have been further innovations in the department of the main participant, and the Masters Degree Programme in Regional Planning has been completely re-developed to be a new Masters Degree in Regional Planning and Sustainable Development; with a specific course newly developed on Sustainable Resources Management. Some of the materials and concepts developed in the 5 courses (listed above) will be used in these courses. Additionally, a new module on SD and Evaluation of Natural Resources Management has been developed for a second Masters Degree Programme that is offered in the GIS Systems and Resource Monitoring. There was also discussion on management practices in the university (e.g. paper usage and waste) and library and information systems development to include more resources on SD. This will be a key feature of the new library and its development. **Action plan and way forward:** The revised / new Masters Degree Programme and the five new courses will be implemented as from September 2014. All have been approved and are seen to be important new offerings in the faculty. Additionally, a research seminar on SD will be hosted by the Faculty Research Directorate in September 2014. Discussions were also held on working together with the research directorate to establish a research agenda for the Masters Programme that addressed local sustainable development needs and issues. This would provide further focus to the Masters Degree implementation, and student research projects that are associated with the Masters Degree programme. Ongoing curriculum development for the four year honours degree will also be taking place, as per initial discussions, and the Librarian has indicated that he will develop a SD 'corner' or information space in the new library.
Relevance of Project to broader Sida ITP HESD programme	**Capacity development and change processes in participants institutions and home countries**: *the initiative has supported capacity development amongst colleagues in the Faculty of Economics at the Catholic University of Mozambique, beyond the two course participants and has included the whole faculty to develop a deeper understanding of new methodologies and the concept of ESD; and has expanded into discussions on SD research in the faculty.*

The second type of analyses we engaged in was a **morphogenic analyses** of selected change projects to consider the processes of change that were or were not occurring as shown in Table 2 below. Morphogenic analysis requires a review of the data to identify what were the existing structures, conditions and context at T1 (when the participant joined the ITP ESD-HE). We analysed a selected number of the change projects using Archers (1995) morphogenic theory of change that is based on a dialectic of structure and agency, and which avoids central conflation, determinism and voluntarism.

Voluntarism refers to a theory of change which assumes that individuals on their own can bring about change, with no interference or influence from societal structures. Determinism on the other hand is a theory of change which suggests that it is only societal structures that influence agents to change, they have no individual will or capacity bring about changes. Central conflation on the other hand, fails to separate the individual from structure, and it is therefore difficult to identify the agent's role in the change process, or how structures are either or enabling or constraining their social action. Archer (1995) suggests that we use an *analytical strategy of 'separating out'* the parts from the people, and that we identify how personal emergent properties, social emergent properties and cultural emergent properties interact to bring about social changes over time. This is helpful to for example, identify how the motivation of an individual academic interacts with university structures (e.g. available committee structures) and the culture of the institution (e.g. its vision and mission and ways of working) to bring about change in a Higher Education Institution. This must, of necessity be different in each and every social context, although certain shared properties (especially institutional structures and/or cultural structures) can exert an ongoing or fairly stable influence on particular individuals in the institution, but the individuals may respond differently to these.

The morphogenic analysis was supported by an auditing process in which participants established what the current 'status' of ESD was in their institutions, often using the Unit-based Sustainability Assessment Tool tool (see Togo's chapter in this Monograph). However, it also required local consultation, as well as other forms of

data capture (e.g. descriptions of the context provided by the participants and/or consideration of university statistics, environmental reports etc.). The morphogenic analysis then involved analyzing the social interactions that took place between T2-T3. These were of various kinds – with facilitators and trainers in Sweden, with facilitators and trainers in regional contexts, and with colleagues in own HEI context. These were captured from reports, documents and observations. Special attention was given to how these related to, and also departed from the initial structural conditions as observed at T1. Following this was the process of establishing whether any changes had occurred at T4. This involved examining whether these changes were:

1) Individual changes (e.g. in knowledge, values or capabilities)
2) Direct changes in institutional practices (e.g. changes to existing curricula)
3) More expansive internal changes in the institutional context (e.g. at departmental or faculty or university level) involving more people in other units other than in the direct sphere of influence of a particular participant or participant group
4) External expansive changes involving wider groups of stakeholders, structural changes and/or longer term changes in culture or structure.

Table 2: A morphogenic (change process) analysis of two examples of institutional change projects over time, showing structure and context influences, course based social interaction influences; and resulting interaction and change processes in Universities.

2011 ITP Change Projects	T1 ...: Existing Structures, Conditions, Context (situating learning)	T2-T3 : Social Interactions (Training Interventions)	T2… T4 : Situated social interactions and structural elaborations (changed practices and conditions)
Key ITP course processes supporting the emerging change processes and products	**Phase 1:** Contextual auditing of existing situation; Identification of situated Change Project (identification of absences; things that could potentially be different)	**Phase 2 and 4:** Exposure to new ideas, examples of practice, networks, tools and strategies through international and regional programme	**Phase 3, 4, 5:** Activities that allowed for reflexive development of changed practices in context e.g. development of materials to support the change; institutional workshops; reporting; action planning.
Botswana: University of Botswana (UB) *Participants:* **Tsayang Gabatshwane Dr Kabita Bose** *Change Project:* **Integration of ESD into Faculty of Education Modules: In Early Childhood Education (ECD) and Education Leadership and Management (ELM) programmes.**	The University of Botswana is a large university (over 21000 students); is rapidly expanding. It has a set of 'graduate attributes' which guide teaching and learning. ESD is not fully integrated into all Education Faculty curricula; and students are not very aware of sustainability issues; although some progress has been made in some departments due to previous ITP and MESA activities. A SADC MESA Chair exists in the Education Faculty which has a focus on curriculum and policy change (previously completed the ITP and a PhD in ESD). Education Faculty Dean is supportive of curriculum change processes.	The participants both drew on some of the ideas and approaches to ESD presented in the Swedish and South African course sessions. They were also able to draw heavily on the SADC MESA network's input and presented their Change Projects for feedback at one such a meeting in Gaborone. At RU during the regional programme they were able to meet specialists in ECD and ELM to refine their programme plans and module outlines. They also made good use of the MESA file materials to guide pedagogical thinking in their modules.	Two revised curriculum modules (ECD and ELM) with strong ESD focus have been completed. The Revised Modules in ECD and ELM have been deliberated at a number of consultative discussion meetings held within the faculty. Support has been provided by the MESA Chair and the Dean of the Faculty. The project has been integrated into the Faculty work plan. The final version of the revised modules are awaiting Senate approval before being used in ongoing teaching in the ECD and ELM Education Faculty Programmes. ESD principles have also been integrated into the UB's graduate attributes document (which shape all teaching and learning at the university). **Shows: Individual changes; direct changes in own practice; and wider institutional level changes**

We documented all of the change projects descriptively (listed in short in Appendix A; see also Agbedahin & Lotz-Sisitka, 2014), but we chose to only analyse a sample of change projects (roughly one third of the 81

change projects) using the morphogenic analysis process. However, the insights from the morphogenic analysis were confirmed by a final 'results report' on the ESD-HE programme (NIRAS, 2015) and insights reported on below draw on all three levels of analysis: the descriptive analysis of all the change projects, the morphogenic analysis of approximately one third of the 81 Africa change projects, and the final results report in which all 139 change projects from Africa and Asia were analysed for trends and types of change.

Findings of the morphogenic analysis: Processes and emergent properties that 'drive', 'enable' and 'shape' changes in HEIs towards sustainability

Overall the morphogenic analysis showed that **in all cases, changes had taken place at the level of individual professional development, and in the sphere of individual changed practice.** In many cases, wider institutional changes were also observed, especially if those involved in the programme were employed in more powerful positions in the university where they were more able to effect structural and/or cultural changes. This was especially noticed at the level of HOD, Dean, Deputy Vice Chancellor or Head of Institute or Division, or amongst national ministry of education staff who participated in the programme. Extended external impact was found in cases that had continued to engage in the change projects initiated during the ITP, and these appeared to materialize over time. Additionally, those who undertook change projects involving a larger number of stakeholders from the start, seemed to be more likely to achieve wider external changes in a shorter time, pointing to the importance of multi-stakeholder engagement in change-oriented learning processes.

In the research analysing these 81 Change Projects from 66 higher education institutions in 25 countries in Africa, we consistently found the following *interacting (in diverse combinations)* **personal emergent properties**, **cultural emergent properties** and **structural emergent properties** to be significant in facilitating change towards sustainability:

Personal Emergent Properties	Cultural Emergent Properties	Structural Emergent Properties
A willingness to learn; An interest in SD issues, futureability, and well being of nation and local communities; Ability to work with others in teams, and to mobilise institutional support at different levels and 'navigate' structural constraints; Disciplinary knowledge, with a willingness to engage with inter-disciplinary knowledge and issues; Value-based commitments to sustainability objectives and interests.	Supportive leadership at faculty and university levels; Existing cultures of practice shaping how curricula are developed and approved (e.g. non-hierarchical, more flexible systems are more enabling); Rapid changes in universities; Networks and communication systems and structures that allow for inter-disciplinary engagements within the university; The MESA programme that supports initiatives such as those seeded in the ITP; and participation in international networks of change oriented learning and sustainability visioning.	Policies and practices oriented towards overcoming the history of neglect of universities in Africa due to earlier World Bank policies, structural adjustment, debt etc. Financial and other resources for operationalising plans; Senate structures (for approval); Giving consideration to the workloads of individuals; Creative approaches for dealing with large student numbers and high demand for HE in Africa; Student involvement and structure for student involvement in sustainability concerns

What is interesting in the findings of the change project analysis over the six year period, is that where individuals have remained in their 'same' positions, there has been ongoing morphogenesis of the change projects. This shows that personal emergent properties (e.g. such as motivation, commitment to values of sustainability etc.) can be an important driver of change processes in universities. Evidence from the change project analysis over time also shows that structural factors can also be key determinants of change or stasis.

For example, in one case, an academic and his colleagues developed an excellent Masters course curriculum framework that was approved by the university senate, and there was a high demand for the programme, but because of large student numbers at undergraduate level, the university could not release enough staff to take up Masters level supervision, despite the fact that the staff concerned had qualified themselves with PhDs in Environment and Sustainability Education. In other cases, it was also noticeable that cultural emergent properties can be key determinants of morphogenesis or stasis as was the case in one university, where the philosophy of ESD was debated and embraced by the Department and this changed the pedagogical practices of staff. This also shows that it is not possible to predict that the same factors will influence change in all institutions, change processes cannot therefore be pre-determined or prescribed. However, evidence from the MESA and ITP programme shows that *change processes can be supported via professional development and change oriented learning processes* in a variety of ways that are responsive and that reflexively take into account the interplay between structural, cultural and personal emergent properties and circumstances. Cases also show that it in some contexts change is easier to effect than in others, and there are many factors that shape and influence change which are both enabling and constraining. Few of the change processes were 'easy', but most were 'possible' at least within the sphere of influence of the participant who was willing to reflexively engage with the change process.

Conclusion

The model of learning and change, on which the MESA and the associated ITP in ESD-HE programme is based, draws on learning theory in the field of environment and sustainability education (social, situated learning theory); and morphogenic (change oriented) social theory. The insights into *how transformation occurs in HEIs towards sustainability* are derived from empirical observation and analysis, but are given meaning and wider purchase (beyond the individual case) through engagement with morphogenic theories of change. This has provided a stronger language of description for explaining *how* change emerges from structure, via social interaction and reflexive deliberations in all cases, not only one case. This still, however, allows for recognising the diversity and particularity of the case. It also allows for observation of *how* new practices emerge through a process of supported reflexive practice in professional learning environments. Doctoral research on the ITP being undertaken by Agbedahin (2015) is showing too that the 'position-practice' system of course participants is a significant determinant of their ability to facilitate or enable changes in institutions, with most changes occurring either within or just at the edge of participants 'spheres of influence'. This points to the significance of power relations as a structural-cultural emergent property in HEI change processes towards sustainability. Additionally, Agbedahin's (2015) research is showing that network structures (e.g. MESA) that are aligned with the objectives of the change oriented ESD initiatives, can also greatly facilitate change oriented praxis in HEIs as these provide an enabling mechanism for deliberating changes. This shows that social and cultural processes are also important determinants of change oriented learning and ESD change processes in HEIs.

As shown in the ITP and the over 81 change projects in African universities, such change oriented learning and associated theoretical insights gained from the model of change has provided a means for informing new, innovative approaches to professional development that actively engage academics across disciplines and functions in universities – even in the most difficult HE circumstances. As shown above, and in Appendix 1, the open process and reflexive model of change helps to 'seed' but not determine a variety of changes towards more sustainable practices in higher education institutions, helping to actualise the challenging task of transforming higher education as per the vision of Principle #1 of the Rio+20 Treaty Principles that were defined for guiding Higher Education re-orientations towards sustainability. As shown in the many projects that have continued to expand after the initial period of the ITP-HE (many of which are reported on in this monograph), the 'seeding change' process has also been done in a way that facilitates ownership of the changes towards sustainability, contextual relevance, widening participation, and an ongoing reflexivity.

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APPENDIX A: List of 81 ESD Change Projects developed in African Universities using the change oriented professional learning model and approach over a six year period.

A: NEW POLICIES AND STRATEGIES

A: New Policies and Strategies: Africa		
Egypt (2012)	University Strategic Plan for ESD developed resulting in more faculties getting involved in ESD mainstreaming	UNI
Ethiopia (2008)	Strategy for mainstreaming ESD into university programmes developed resulting in more academics in the university getting involved in ESD and contributing to the Mainstreaming Environment and Sustainability in Ethiopian Universities initiative (MESE, a country-based adaptation of MESA)	UNI
Ethiopia (2011)	Guidelines for ESD mainstreaming developed resulting in expanded staff and student participation in ESD, and establishment of a new sustainability unit in the university	UNI
Ethiopia (2013)	Guidelines for community engagement researched resulting in recommendations for university policy	UNI
Kenya (2009)	Monitoring of ESD implementation in HEIs undertaken resulting in reporting to the National Environmental Authorty and greater support for MESA in Kenya	NM
Liberia (2009)	Implementation of ESD policy for National Youth Service undertaken by the National Commission of Higher Ed resulting in expanded engagement with youth in ESD issues, and a MESA chapter for Liberia	NM
Morocco (2013)	Charter for mainstreaming ESD into HEIs developed resulting in a consultative process with Ministry of Higher Education to mainstream ESD into the HEI system	NM
Mozambique	Strategy for adoption of ESD in HE policy developed by the Ministry of Higher Ed resulting in greater	NM

(2009)	awareness of ESD in the Ministry	
Mozambique (2013)	Community engagement policy (one student-one family) developed for the university to guide practice resulting in implementation of the programme across faculties at the university's Unanga campus	UNI
Mozambique (2013)	Ministry of Higher Education set up curriculum and research development fund for ESD resulting in academics being able to get SD research funded via national funding instruments	NM
Namibia (2009)	ESD policy developed for University of Namibia resulting in expanded mainstreaming of ESD in UNAM	UNI
Nigeria (2008)	Mainstreaming of ESD into Nigeria's HEI curriculum for 93 universities proposal developed and presented to National Universities Commission resulting in some uptake, although full implementation of the proposal did not take place.	NM
Nigeria (2008)	Students as Change Agents Programme developed and implemented in mainstreaming at OAU via MESA resulting in stronger student engagement in the OAU MESA programme	UNI
Sudan (2008)	ESD policy for university developed resulting in a policy and strategy for ESD, but it could not be implemented due to disruptions in the wider society.	UNI
Swaziland (2011)	ESD mainstreamed into commerce faculty policy and strategies in accordance with wider university MESA processes resulting in strengthening and expanded impact of the UNISWA MESA programme, and engagement with local businesses in ESD issues.	UNI
Uganda (2009)	ESD mainstreamed into university policy and strategy, and pedagogy resulting in a university strategy, new curricula, and expanded mainstreaming of ESD into the university system, and development of a Regional Centre of Expertise linked to the university.	UNI
Uganda (2009)	Assessment of ESD in HEIs in Uganda undertaken (pilot tested in programme, but sought to expand to 160 HEIs) resulting in expanded support for Uganda's MESA programme from within the ministry.	NM

- *Table includes: Country; Year of Project; Change Project and type of institution implementing the Change Project (NM=National Ministry, UNI= University; O-HEI = Other HEI e.g. Institute of Technology, College of Natural Resources or College of Education)*
- *Shaded areas show more than one policy initiative per country*

B: NEW MANAGEMENT PRACTICES

B: New Management Practices: Africa		
Egypt (2009)	Waste Paper Management Programme resulting in reduction of paper wastage in the university, and greater awareness	UNI
Ethiopia (2013)	Kaizen (cleaner production and quality organisational management) principles implementation at ministerial level, with a pilot institutional programme established and implemented that demonstrates exemplary clean and green production systems in a university of technology	NM & UNI
Gambia (2008)	SD and quality assurance capacity building leading to expanded awareness and capacity for implementing ESD	NM
Mauritius (2008)	Development of Eco-Campus Initiative leading to new campus management practices	UNI
Zambia (2011)	Green Campus Project in College of Education resulting in the planting of over 4000 trees on campus, improved participation, and a range of improved campus management	O-HEI

	practices as well as curriculum innovation for ESD.	

Table includes: Country; Year of Project; Change Project and type of institution implementing the Change Project (NM=National Ministry, UNI= University; O-HEI = Other HEI e.g. Institute of Technology, College of Natural Resources or College of Education)
Shaded areas show more than one management practice initiative per country

C: NEW TOOLS AND METHODS

C: New Tools and Methods: Africa		
Cameroon (2008)	Mainstreaming ESD into Land Law Curriculum resulting in new ways of teaching the Land Law curriculum	UNI
Egypt (2012)	Teaching toolkit for Environmental Sciences resulting in new and activities for undergraduates and postgraduates to use to facilitate interactive teaching and learning	UNI
Ethiopia (2012)	Conceptual framework for Forestry Education renewal resulting in a new framework for Forestry education for all institutions teaching forestry in Ethiopia and an associated curriculum network	UNI
Morocco (2013)	Interactive pedagogy, content and ICT for Teacher Education resulting in new ICT-based methods for ESD in teacher education	UNI
Mozambique (2012)	Interactive instructional teaching and learning approaches resulting in new philosophy of teaching and engagement of students in service learning activities with SD outcomes	UNI
Rwanda (2009)	ESD teaching methods for Teacher Education resulting in new approaches to teaching in the teacher education programme	UNI
Rwanda (2012)	ESD teaching methods integrated into Fundamental Life Skills for Teachers programme resulting in new more community oriented and service learning approaches being used	UNI
Uganda (2008)	Development of teaching materials for ESD in Education Faculty resulting in exposure of students to SD issues in the community implementation of service learning approaches, as well as establishment of a Regional Centre of Expertise in ESD	UNI
Zambia (2011)	Booklet on SD issues in Zambia for B.Ed (EE) course resulting in students being able to access local content on ESD issues and to conduct own research on local SD issues	UNI

Table includes: Country; Year of Project; Change Project and type of institution implementing the Change Project (NM=National Ministry, UNI= University; O-HEI = Other HEI e.g. Institute of Technology, College of Natural Resources or College of Education)
Shaded areas show more than one methods and tools development initiative per country

D: NEW PROGRAMMES AND COURSES

D: New Programmes and Courses: Africa		
Botswana (2008)	Development of an inter-disciplinary masters in Education Curriculum Framework (M.Ed: EE&ESD) resulting in a new programme framework for offering this course in the Faculty of Education at UB. This has resulted in a new doctoral programme getting underway and improved knowledge of ESD amongst staff. The M.Ed programme has not yet been run due to capacity for research supervision and large undergraduate classes.	UNI
Botswana (2009)	Integration of ESD into Language and Literacy Education Course in the Faculty of Education resulting in curriculum innovation in the Faculty of Education and improved knowledge of ESD amongst staff at UB but also more widely via a conference that was	UNI

	hosted linked to the change project	
Botswana (2011)	Integration of ESD into ELM and ECD courses resulting in new programme offerings in the Faculty of Education and improved knowledge of ESD amongst staff and students. Also resulted in revision of graduate attributes in the instiution.	UNI
Egypt (2008)	Development of Sustainable Agriculture Curriculum resulting in new curriculum offering in the Faculty of Agriculture and improved SA knowledge amongst staff and students	UNI
Egypt (2012)	Development of ESD focus in Household Management Curriculum resulting in new curriculum offering in the Faculty of Specific Education and improved engagement amongst staff and students in the faculty, and improved community engagement, research networking and a national conference on ESD.	UNI
Egypt (2012)	Integration of ESD into 25 modules in 4 faculties resulting in the development of a whole Whole University Approach to ESD with improved engagement with SD issues amongst staff, students and university management (also influenced university policy).	UNI
Egypt (2012)	Integration of ESD into Tour Guidance Curriculum resulting in curriculum renewal in the Faculty of Tourism and Hotel Management and improved engagement with SD issues amongst students and staff.	UNI
Ethiopia (2009)	Integration of ESD into distance education courses resulting in curriculum renewal that could influence offerings across faculties and improved understanding of SD issues amongst staff and students.	UNI
Ethiopia (2011)	Integration of ESD principles into 16 modules of the Integrated River Basin Management M.Sc Programme resulting in curriculum renewal in the Faculty of Science and amongst six partner universities that were also sharing the curriculum via a networked masters development programme. Also resulted in higher levels of engagement with SD issues amongst staff and students.	UNI
Ethiopia (2011)	Development of ESD Module for Post Graduate in Higher Education and Teaching PGDHET programme used for training of all academic staff in the university. Improved engagement with ESD issues in the Faculty of Education and curriculum renewal in the PGHET programme, and improvement of engagement with SD issues amongst other staff in other faculties.	UNI
Ethiopia (2013)	Development of ESD Module for PGDHET programme used for staff training resulting in curriculum renewal in the School of Social Science and Humanities and improved understanding and engagement with SD issues amongst faculty and university staff and students, and also linked to student green campus and ESD engagement programme.	UNI
Ethiopia (2013)	Development of ESD module for Postgraduate Diploma in Education resulting in improved offerings in the teacher education programme of the Faculty of Education, as well as expanded curriculum change influences into other programmes that the Faculty of Education is supporting (university modularisation), and improved engagement with SD amongst staff and students.	UNI
Ethiopia (2013)	Development of New M.Sc Degree in Kaizen principles focussing on integrated quality management and cleaner production and a new programme offering in the Faculty of Engineering which is being developed as a model programme for expansion to other universities via partnership with the Ministry of Higher Education. Expanded SD knowledge amongst staff and students, and associated business partners and the Ministry of Education.	UNI
Kenya (2008)	Restructuring of the Dept. of Agricultural Economics Courses to include ESD resulting in curriculum renewal in the Faculty of Agriculture and improved engagement with ESD	UNI

	issues amongst staff and students.	
Kenya (2012)	Development of new ESD curriculum for Kenya School of Government resulting in a training of trainers programme for whole institution development and new programmatic offering for training of government officials in Kenya. Improved knowledge of SD issues and policies amongst staff and government officials undergoing the training.	UNI
Kenya (2012)	New MA in Environmental Security and SD resulting in a new programme offering for the Faculty of Arts and Humanities. Improved knowledge of SD and Environmental security issues amongst staff and students.	UNI
Liberia (2008)	Mainstreaming of ESD into National Youth Service Programmes by the University Association allowing for youth engagement with SD issues within a whole system approach resulting also in improved knowledge and engagement with SD issues amongst trainers and youth involved in the initiative.	UNI
Madagascar (2008)	Development of ESD Teacher Education programme and Toolkit resulting in curriculum renewal in the Faculty of Education and improved engagement with ESD issues amongst staff and teachers in training, also new classroom resources for use in schools.	UNI
Morocco (2013)	Integrated ESD into English Department curriculum resulting in curriculum renewal in the Faculty of Letters and improved engagement with SD issues amongst staff and students in the faculty	UNI
Mozambique (2012)	Integrated ESD into B.Sc Agricultural Sciences resulting in curriculum renewal in the Faculty of Agriculture and higher levels of engagement with SD issues in relation to agriculture in Mozambique by students and staff	UNI
Mozambique (2013)	Integrated ESD into M.Sc in Regional and Development Planning resulting in curriculum renewal in the Faculty of Economics and Management and expanded engagement with SD issues amongst staff and students, also linked to green campus initiative, and wider staff development programme for integration of SD into other faculties.	UNI
Nigeria (2008)	General ESD course for all students developed resulting in a new programme offering for the university for use across all faculties and improved understanding of SD issues amongst staff and students	UNI
Nigeria (2008)	Mainstreaming ESD in the Humanities Faculty curriculum resulting in a new programme offering in the Faculty of Humanities and improved understanding of SD issues amongst staff and students	UNI
Nigeria (2008)	Entrepreneurship training for Teacher Education resulting in a new programme offering in the Faculty of Education and improved understanding of SD issues amongst staff and students and improved community engagement approaches	UNI
Rwanda (2012)	Integration of ESD into Engineering Curriculum resulting in curriculum renewal in the Faculty of Engineering and improved knowledge of SD issues amongst staff and students	UNI
Senegal (2008)	Integration of ESD into doctoral programmes on Water, Water Quality and Use resulting in an expanded doctoral programme and new research in the Faculty of Arts and Sciences as well as expanded international linkages for the doctoral programme	UNI
Seychelles (2008)	Development of core module for new University of Seychelles resulting in a new programme for use across the institution which was newly forming at the time, thus also laying the foundation for SD related curriculum development in all new programmes.	UNI

South Africa (2008)	Development and expansion of Environmental Law Programmes resulting in new programme offerings in the Faculty of Law, an expanded engagement with SD issues amongst faculty staff and students, including green campus activities, wider networking, expanded SD related research and new staff appointments.	UNI
South Africa (2008)	Revision of EE/ESD Masters Course resulting in curriculum renewal in the Faculty of Education which has influenced the design of a range of related courses and degree programmes, new research approaches and improved engagement with new SD concepts amongst staff and students.	UNI
South Africa (2009)	Integration of ESD into Faculty of Education courses (final year) resulting in curriculum renewal in the Faculty of Education and expanded engagement with SD issues amongst staff and students.	UNI
Tanzania (2008)	ESD Module for Development Studies Course resulting in curriculum renewal in the university and improved links between the Faculty of Law and Social Science, and expanded engagement with SD issues amongst staff and students.	UNI
Tanzania (2013)	Integration of ESD into B.Ed Arts Programme resulting in curriculum renewal in the College of Education with stronger engagement with communities and SD issues amongst staff and students	UNI
Tanzania (2013)	Development of new Masters and PhD programme on Innovation and Entrepreneurship - Dept. of Business Studies and Humanities resulting in new programme offerings in the NM Institute of Science and Technology and greater engagement with SD issues amongst staff and students.	UNI
Tanzania (2013)	Integration of SD into Science and Technology curricula resulting in new programme offerings in the Dept of Mechanical Engineering and Science and Business Management and a whole institution engagement with SD issues leading to expanded engagement with SD issues amongst staff and students, and improved university policy (the one participant was a DVC).	UNI
Tanzania (2013)	Development of new course on business opportunities and SD entrepreunership resulting in a new programme for use across the whole University and expanded engagement with SD amongst students and teachers	UNI
Uganda (2011)	Integration of SD into Educational Administration courses leading to curriculum renewal in the Faculty of Education and expanded engagement with SD issues amongst staff and students	UNI
Uganda (2011)	Mainstreaming SD into Religious Education Courses resulting in new programme offerings in the Faculty of Education and the establishment of a community service programme focussing on 'Green Foods' to address poverty related issues, enhanced engagement with SD issues amongst staff and students and community engagement partners	UNI
Uganda (2011)	Mainstreaming ESD into Teacher Education Programmes resulting in curriculum renewal in the Faculty of Education and expanded engagement with SD issues amongst staff and students	UNI
Zambia (2008)	ESD Training of Trainers Programme resulting in curriculum revision in the Public Admin Courses in the National Institute of Public Management and expanded engagement with SD amongst staff and course participants (mainly government officials)	O-HEI
Zambia (2009)	ESD integration in School of Built Environment Programmes resulting in curriculum renewal in the School of Built Environment and expanded engagement with SD issues	UNI

	amongst staff and students	
Zambia (2011)	New M.Sc courses in the Environment and NRM programme resulting in curriculum renewal in the School of Natural Science & Geography and expanded engagement with SD issues amongst staff and students	UNI

Table includes: Country; Year of Project; Change Project and type of institution implementing the Change Project (NM=National Ministry, UNI= University; O-HEI = Other HEI e.g. Institute of Technology, College of Natural Resources or College of Education)
Shaded areas show more than one curriculum change initiative per country

E: NEW STRUCTURES AND NETWORKS

E: New Structures and Networks: Africa		
Ethiopia (2013)	Establishment of a New Sustainabilty Unit in the university (based on 2011 guidelines developed) and resulting in university management approval of the unit and expanded use of the guidelines by staff in the university	UNI
Kenya (2013)	Development of the East and North African MESA network resulting in expanded networking amongst MESA partners in these areas	O-HEI
Kenya (2008) (UNEP)	Planning and implementation of first MESA Conference resulting in the further development of the MESA network	O-HEI
Kenya (2008)	Expanded the ICRAF programme for the ANAFE network (African Network for Agriculture, Agroforestry and NR) to improved SD content and uptake in the ANAFE network (across African countries)	O-HEI
Kenya (2012)	Establishment of a networked, multidisciplinary ESD community of practice in a university leading to whole institution ESD development, new research, and expanded engagement with community projects	UNI
Kenya (2012)	Competence-based curriculum development programme for TVET colleges resulting in more TVET colleges integrating ESD into their programmes, and exposure of ESD competence programme at the National TVET fair with more student innovation programmes focussing on ESD	NM
Malawi (2009)	Integrated Agriculture Learning Centre at the NR College of Malawi resulting in wider engagement with SD issues amongst staff and students and partner organisations	O-HEI
Nigeria (2008)	Lifelong learning centre for SD (university wide) resulting in expanded programme engagements with SD issues amongst a range of faculties and university partners	UNI
Nigeria (2008)	MESA SD Centre (university wide) resulting in staff, student and partner engagement with SD issues across the university and within the region establishment of a wider ESD network for West/Central Africa.	UNI
Senegal (2008)	Doctoral school links to AMCOW, NEPAD, UNESCO/BREDA and National Commission of Sustainable Development resulting from expanded networking, research and engagement for water research in West Africa	UNI
South Africa (2011)	NMMU Green Campus Initiative resulting in expanded student mobilisation and a wider range of student-led sustainability activities and practices on campus	UNI

Table includes: Country; Year of Project; Change Project and type of institution implementing the Change Project (NM=National Ministry, UNI= University; O-HEI = Other HEI and O-HEI INT (n) = Other HEI - International Network)
Shaded areas show more than one structure / network development initiative per country

Chapter 3: Development, Use And Significance Of The Unit-Based Sustainability Assessment Tool For Universities In Africa And Asia

Muchaiteyi Togo

(University of South Africa, South Africa)

Abstract

Six years have passed since the Unit-based Sustainability Assessment Tool (USAT) was developed for use in sustainability mainstreaming in universities. It was developed in 2008 (and published in 2009) as part of a PhD located within UNEP's MESA Universities Partnership, a project initiated to facilitate mainstreaming of sustainability within universities. The development of the tool was in line with Phase 1 activities of the MESA Universities Partnership whereby the need for a systems approach in sustainability mainstreaming was identified. Linked to this systems approach was a need for a relevant supporting auditing tool that could inform decision-making processes, particularly in identifying Change Projects. The tool, based on a systems thinking approach and informed by critical realism and other sustainability assessment tools (SATs), has the advantage of in-built flexibility, which allows it to be used at different levels (e.g. programme, department, and faculty). It therefore caters for a variety of needs. The use of the tool within the International Training Programme started in 2008 in Africa, during its pilot phase, but has since spread to Asia. This paper discusses the rationale behind the development of the tool, how best to use the tool and what it has enabled within the MESA partnership.

Background to ESD Mainstreaming

The Decade of Education for Sustainable Development (DESD) (2004 to 2015) was launched following the realisation that education was indispensable in achieving sustainable development (UNESCO, 2005). As argued by Orr (1994, p. 5), "The kind of education we need begins with the recognition that the crisis of global ecology is first and foremost a crisis of values, ideas, perspectives, and knowledge, which makes it a crisis of education, not one in education". A transformative agenda was therefore necessary, both in thinking processes and practices. While all education institutions have a role to play, the role of higher education, particularly universities, in realising the aims of the DESD is more critical and, in essence, catalytic. This is because they are centres for the creation / development and dissemination of knowledge (Tünnermann Bernheim & de Souza Chaui, 2003). The role of universities is to seek solutions to societal problems, they have a responsibility for lower educational levels (primary and secondary) through teacher education, and it is their task to critically engage with knowledge and values and to develop future leaders of our social graduates, who can contribute in the advancement of knowledge and ensuring a high quality of life in future (Clugston, 2000). Waas et al. (2012, p. 8) argue that based on these and other roles, universities should be "moral visionaries and centres of sustainability innovation and excellence".

Sustainability partnerships in higher education played a significant role in promoting sustainability mainstreaming to fulfil the DESD aim of integrating sustainability in university functions and operations. Just after the DESD was launched, sustainability partnerships started grappling with the concept; addressing

issues of how to implement ESD. The Global Higher Education for Sustainability Partnership (GHESP), which predates the DESD (it was formed in 2000) was reaffirmed as a Type II partnership[6] at the WSSD in 2002 (UNEP, 2006). Its main objective was developing and sharing strategies, models and best practices for promoting higher education for sustainability, and analysing experience in order to make recommendations in consultation with key Northern and Southern stakeholders (Clugston and Calder, 2002)[7]. The other partnership is the Association for University Leaders for a Sustainable Future (ULSF)[8], which was formed with the mission to "support sustainability as a critical focus of teaching, research, operations and outreach at colleges and universities worldwide through publications, research, and assessment" (ULSF, 2008, unpaged). The Mainstreaming Environment and Sustainability in Africa (MESA) Universities Partnership was also formed, at regional level, to implement the United Nations DESD objectives in and through universities in Africa (UNEP, 2006). The objectives set out to strengthen Africa's capacity in responding to sustainability challenges, by enhancing the quality and policy relevance of university education in Africa in the context of sustainable development and the Millennium Development Goals (Ogbuigwe, 2007).

ESD mainstreaming in higher education was also discussed at various international fora and from some of the gatherings emerged sustainability declarations in higher education. It is through these declarations that the priorities for universities in mainstreaming sustainability were defined. An example of a declaration that informed the PhD study is the Talloires Declaration, which identified priorities like developing ecological literacy, developing interdisciplinary curricula, encouraging research that contributes to sustainability, and having sustainable physical operations (Wright, 2002; 2004).

The role and purpose of SATs

While the fact that universities have a role to play in Education for Sustainable Development (ESD) has not been disputed much in literature, and that key focus areas for sustainability mainstreaming in universities were identified through sustainability declarations, the remaining challenge was an absence of clear cut guidelines as to how ESD can be implemented. Roorda (2001), referring to sustainability charters and declarations in higher education, the Talloires among them, observed that:

> Although these documents contain important guidelines for education, none of them offers concrete prescriptions on an operational level for what Higher Education should do exactly in order to contribute maximally to sustainable development (Roorda, 2001, p. 6).

This gap is one of the main reasons why sustainability assessment tools (SATs) were developed, either within or outside sustainability partnerships. SATs were also developed to operationalise ESD policy guidelines in higher education, to define priorities for universities, to identify weak areas in terms of ESD implementation, and to benchmark mainstreaming initiatives (Shriberg, 2002a). Besides benchmarking initiatives, SATs also help to measure progress with time and provide a basis for institutions to compare and reflexively review their sustainability efforts. Assessment data collected using SATs can be used to develop sustainability reports, which, according to Lozano (2006), help to communicate the efforts and progress of the organisation / institution to stakeholders. According to Shriberg (2002b, p. 74-76), ideal sustainability assessment tools should:

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[6]Type II partnerships were outcomes of the World Summit and involve governments, NGOs and businesses. 283 Type II Partnerships were announced at the WSSD and approximately 12 of these are focused on education for sustainability (Clugston & Calder, 2002).
[7]GHESP is no longer operating as its term of operation expired at the end of 2007 (ULSF, 2002).
[8]ULSF also serves as the Secretariat for signatories of the Talloires Declaration, a ten-point action plan committing institutions to sustainability and environmental literacy in teaching and practice. Over 350 university presidents and chancellors in more than 40 countries have signed the declaration.

- *identify important issues*: "Sustainability assessment tools should address contextually appropriate issues of major importance to campus environmental, social and economic efforts and effects";
- *be calculable and comparable*: "The ability to calculate progress toward sustainability is often a limiting factor in assessment. Campuses require quick, yet penetrating ways to measure status, progress, priorities and direction";
- *move beyond eco-efficiency*: "eco-efficiency indicators stress material utilization, environmental performance and regulatory compliance, while sustainability indicators stress issues at the nexus of the environment, society and economy with the goal of no negative impacts";
- *measure processes and motivations*: "the tools to measure sustainability should delve deep into decision making by asking about mission, rewards, incentives and other process oriented outcomes"; and
- *stress comprehensibility*: "Sustainability assessment tools should be comprehensible to a broad range of stakeholders".

Motivation and a brief historical context of the development of the tool

The Unit-based Sustainability Assessment Tool (USAT) was developed within the context of the MESA Universities Partnership with the aim of enabling a whole systems approach to sustainability mainstreaming among participating universities. The MESA Universities Partnership employed a phased approach with ESD implementation subdivided into three periods[9]. Among a few weaknesses identified from the implementation of Phase 1, was a lack of a systems approach at university level, with the programme relying on project implements by individual change agents (Ogbuigwe, 2008). Therefore, there was a need for a stronger systems approach "to be developed in MESA to support systemic changes in universities, so that innovations were not only dependent on individual efforts and university leaders needed to become more involved" (UNEP, 2008, p. 32). Research support to investigate the systems approach was provided in the form of a PhD study.

Designing and developing an appropriate auditing tool for use in universities to provide "good quality starting points to inform decisions on change projects" also became a key activity located within the PhD research (Lotz-Sisitka & Hlengwa, 2011, p. 6). At that stage, it was already evident from the programme that mainstreaming involved many different activities in the university, depending on focus, status and level (Lotz-Sisitka & Hlengwa, 2011). Issues of flexibility in use were considered and built into its design. The USAT was developed as a MESA-linked output to strengthen the programme toolkit and other associated activities.

The USAT was used to collect data for the PhD, which also served to pilot test the tool in a whole institutional assessment of the curriculum and other practices. During the same year, it was also piloted in other MESA universities. Feedback from the pilot tests resulted in the further improvement of the tool. It was then published in 2009 for further use within and to support the MESA Universities Partnership. The same year it was selected by UNESCO, as part of the broader MESA Universities Programme, as one of the five projects from Africa for exhibition at the World Conference on Education for Sustainable Development in Bonn, Germany.

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[9] Phase 1 (2004-2007): Establishing and piloting of the MESA Universities Partnership Project in 15% of African Universities; Phase 2 (2007-2010): Consolidation and strengthening of MESA Universities Partnership Project activities in 30% of African Universities; and Phase 3 (2011-2014): Expansion of the MESA Universities Partnership to 60% of African Universities (UNEP, 2007, p. 1).

The logic behind USAT design features

Justification and theoretical grounding

The basic argument behind the structure of the USAT was that, in order to succeed in Education for Sustainable Development, universities and other education institutions need to depart from reductionist approaches, whereby educational programmes have a limited approach to disciplinary content and in all other functions and operations. This was supported by a growing body of literature on sustainability mainstreaming that argued for a whole systems approach as:

i)   the missing or lacking unifying theoretical framework that can help education practitioners to develop guidelines to effectively meet sustainability goals (Krasny, Sriskandarajah, Sterling & Tidball, n.d.);

ii)   a theory that can aid in the "transformation of higher education towards the integrative and more whole state implied by a systemic view of sustainability in education and society" or else the response of higher education to sustainability is likely to be partial and rather "a limited adaptive response" (Sterling, 2004, p. 50-51);

iii)   an "emergent postmodern paradigm", which suggests an epistemological change from reductionism towards holism, where higher education institutions are expected to respond sufficiently (*response-ability*) to the wider social context of the crisis of unsustainability, viewing education as a subsystem of society (Sterling, 2004, p. 50); and

iv)   a theory that can be applied in higher education, e.g. in the development of courses and training / education programmes, in thinking about and effecting change in the organisations that make up the higher education sector; and in thinking about and effecting designs for the higher education sector as a whole (Ison, 1999, p. 108).

The tool was informed by systems thinking concepts including:

- holism, which argues that systems of various orders cannot be understood by investigating their parts in isolation (Bertalanffy, 1968), as the properties of parts cannot explain their combined effect (see the concept of emergence explained below) (Banathy, 1997; Gilbert & Sarkar, 2000; Sayer, 2000; Danermark et al., 2002);
- hierarchy theory, which explains the differences between different levels of complexity, where systems are arranged in a hierarchy of complexity (Boulding, 1956, Checkland 1999);
- the concept of an open system where universities are modelled as human activity systems (which are open systems) sustained by internal and external relations and the process of regulation; and are in exchange of energy with their environment (Banathy, 1992; Checkland 1999); and
- the concept of feedback, which explains the exchange of materials, energy and information between an open system (the university) and its environment (the community and broad environment), and helps to explain the outcomes of a system in relation to the expected goals (Bertalanffy, 1968; Banathy, 1996).

The development of the tool was also informed by critical realism, particularly the concept of emergence and the structure agency debate from a critical realist perspective. Critical realism argues that the world is characterised by emergence, where the conjunction of two or more features leads to the development of new phenomena with properties that cannot be reduced to those of their constituents (Sayer, 2000). The concept of emergence explains new properties that result from the conjunction of two or more features. Even though the concept of holism was found to be relevant in designing the tool, the critical realist theory of social change was also taken into consideration in developing the tool, as it argues that different strata or units (sub-systems in systems theory) may possess different emergent properties and powers or "anterior" powers different from the powers of other strata, thus "having independent causal powers" that influence the whole in unique ways (Archer, 1995, p. 14). Effectively, this meant taking into consideration the fact that faculties / departments / units may have different structures, histories, priorities, resources, leadership styles, visions, and philosophies

(including understandings of sustainable development), and may therefore influence the whole system in unique ways. Thus, the design of the tool had to observe both the theory of social change and emergence.

In summary the discussed theories informed the USAT as follows:
- the university is viewed as a whole system with its own functional units (sub-systems), but also as a sub-system of society. USAT indicators therefore assess both the contribution of the tool to university sustainability and in terms of responsiveness to its environment in which it is a sub-system (holism, hierarchy, open system);
- USAT assessment results help to identify areas where institutions are lagging and therefore point out areas where universities can focus on to enhance their contribution to sustainability both within the institution and in the environment (feedback); and
- the USAT design is founded upon a unit-based structure to enable data collection at department / faculty level, yet still enables the creation of a whole picture of sustainability to be built from the same results (social theory, emergence).

Experiences with earlier developed SATs
Only three tools that were easily accessible online at the time of the PhD study were reviewed to consider their appropriateness in collecting relevant research data. After reviewing the three SATs, none of them was found to be perfectly aligned with the objectives of the PhD research and the aims the MESA Universities partnership. The three tools were therefore reviewed with the aim of informing a new and relevant tool.

A summary of the review of other SATs

NB: This summary is based on an earlier publication by Togo and Lotz-Sisitka (2013).

Within the context of the Association for University Leaders for a Sustainable Future (ULSF), the Sustainability Assessment Questionnaire was developed with the aim of providing a snapshot of institutional sustainability practices. Therefore paving way for designing sustainability strategies at the local level (Shriberg, 2004). One of its main virtues has been identified as defining sustainability in higher education comprehensively (Shriberg, 2004). While the ULSF argues that its main weakness is that it is qualitative and impressionistic and that responses cannot be used to rate or compare institutions (ULSF, 1999), during the PhD study it was also found that it was difficult to establish the contribution of individual university functional units to the comprehensive picture of sustainability it creates as information is collected at institutional level. In addition to this concern there is the challenge of finding individuals who are adequately knowledgeable to fully respond to the questions. The data collection process using the SAQ is also tedious and time consuming as respondents are expected to list, for example, all the courses and research efforts related to sustainability (Shriberg, 2002b).

The Auditing Instrument for Sustainability in Higher Education (AISHE), which was developed following a request by the Dutch *Committee for Sustainable Higher Education* (*Commissie voor Duurzaam Hoger Onderwijs*, CDHO), was also in response to the fact that there were no guidelines as to what universities were exactly required to do in mainstreaming sustainability (Roorda, 2001). It was developed to generate a list of criteria for auditing sustainability (internal or external) to establish the level to which a university (or part of it) has succeeded in implementing sustainability. While its virtues are identified as the in-built process oriented approach and fostering participation in the auditing process, its major weakness is that it is based on criteria that are abstract and difficult to understand and it is not based on indicators, making it difficult to understand the goals or aims of mainstreaming (Shriberg, 2002b).

The third and last tool reviewed is the tool for the Graphical Assessment of Sustainability in Universities (GASU), which was modelled against the Global Reporting Initiative Sustainability Guidelines (Lozano, 2006). Aimed at facilitating analysis, comparison and benchmarking of sustainability efforts, the GASU is based on quantifiable indicators that enable graphical representation of sustainability assessment results and,

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according to Lozano (2006), enables better transparency, consistency and usefulness for decision-making compared to accounts and narrative assessments. While the GASU is holistic in terms of the dimensions of sustainable development (the indicators are subcategorised into economic, environmental, social and educational dimensions), the indicators in the context of the aims of the PhD study were found to be limited as they are not aligned with university functions and operations and therefore omit functions like policy, university management and student initiatives.

Therefore, after reviewing the three tools, it was decided to develop an assessment tool that was informed by the existing tools and the aims and objectives of the PhD and, consequently, the needs of the broad MESA Universities Partnership initiative. Even though the USAT was informed to a large extent by the existing tools, it was also based on the research context. Table 1 indicates how the USAT was informed by the three SATs.

Tool	Definition of university sustainability	Indicators	Assessment criteria	Data representation	Design	Respondents
SAQ	✓	✓	✓		✓	✓
AISHE		✓			✓	✓
GASU			✓	✓	✓	✓

Table 1: How earlier developed SATs informed the USAT

Other factors

Consideration was also made of environmental factors and the context in which the USAT was going to be used, particularly in the development of indicators. Besides the features that were influenced by the theories informing the PhD study and the earlier developed SATs, the tool also had to consider international policy guidelines and objectives as defined by the declarations. The tool needed to be relevant to the context in which it was going to be employed in assessing sustainability. There was a need to develop indicators that can be used to measure progress in the areas identified to be of critical importance to higher education through declarations. Some of these areas relate to the responsiveness of the universities to the context in which they are located, and to the practices aimed at sustainable management of the campus environment. This was very important because sustainability challenges and needs differ with contexts.

The design of the USAT

The design features of the USAT have already been fully documented in previous research papers and the PhD thesis (Togo, 2009; Togo & Lotz-Sisitka, 2009; Togo & Lotz-Sisitka, 2013). This chapter will therefore not go into detail, but will briefly summaries those features found to be relevant and useful in the MESA Universities Partnership.

Division into units

The unique feature that distinguishes the USAT from the discussed three tools is its unit-based framework, which also serves to provide building blocks in terms of developing a whole university picture of sustainability from assessment data. Figure 1 is a representation of the parts of the USAT and the institutional operational functions each of the parts is intended for.
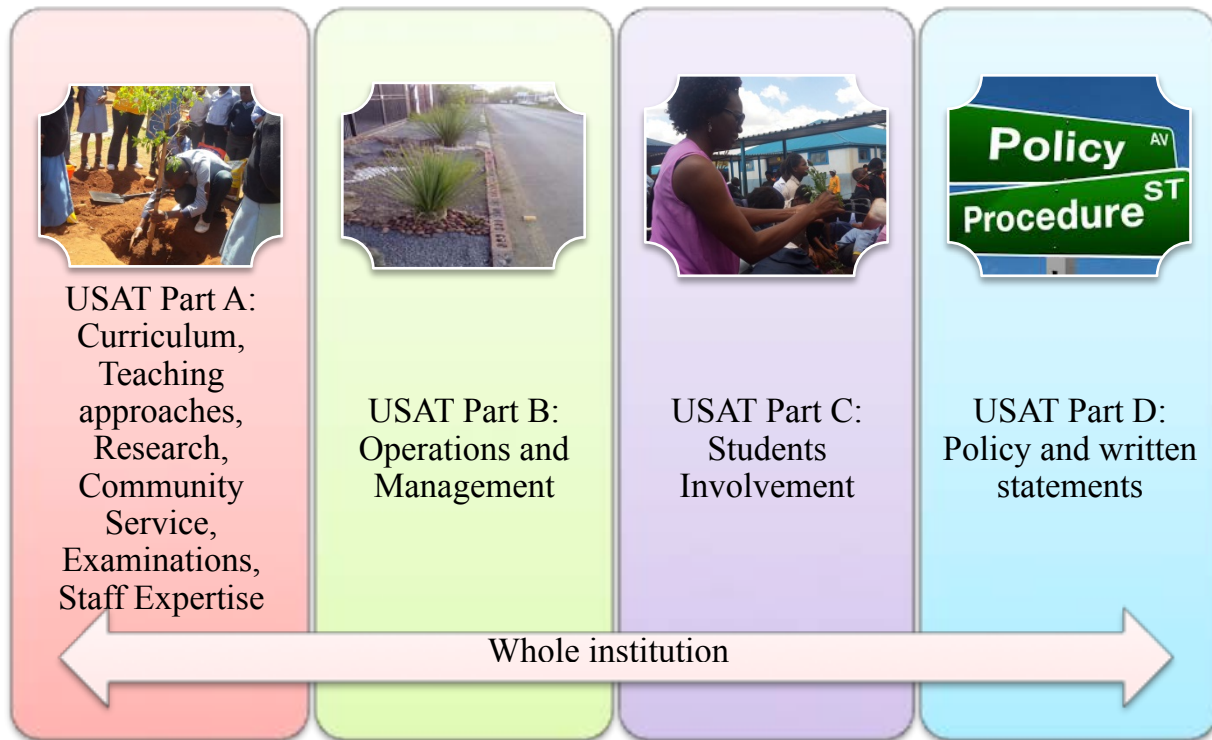
Figure 1: Parts of the USAT

Each of the four parts depicted in Figure 1 contains a list of indicators that function as guidelines of initiatives and practices that universities are encouraged to engage in as part of sustainability mainstreaming (see Appendix 1 for the indicators).

USAT indictors were arrived at after a review of literature on sustainability in higher education, earlier developed SATs, systems theory and critical realism. They entail initiatives, practices and aspects of university functions that are useful in determining how the university is performing in terms of sustainability mainstreaming. Basic features of these indicators are that they are measurable, thus they can be used for benchmarking initiatives and for progress reporting, including comparative analysis across institutions. Another feature, as captured in Figure 2, is that they are meant to guide the universities (just like other SAT indicators) as to which initiatives they should focus on in sustainability mainstreaming. As depicted in Figure 2, additional aspects that characterise USAT indicators are that they are open-ended, allowing users of the tool to identify more indicators where relevant, leave out those indicators that are not relevant to the context, or modify the existing ones. Take note that Part B and C of the tool slightly differ in that they do not just detail indicators. They also ask for additional information, e.g. what can be done to improve the practice (Part B) and an outline of activities (Part C) (see Appendix 1).

Areas identified as crucial for universities interested in mainstreaming sustainability to get engaged in			
Indicators should be treated as guidelines	Indicators can be modified depending on context	More indicators can be identified, and added	Indicators found to be inapplicable to a certain context can be omitted in the assessment

Figure 2: Characteristic features of USAT indicators

In assessing sustainability using the USAT, the selected respondent rates each of the indicators against predefined assessment criteria that use ordered response levels (see Togo & Lotz-Sisitka, 2009, Togo & Lotz-Sisitka, 2013 for elaboration). The assessment criteria are provided in each of the four parts of the tool (see Appendix 1).

Built into the criteria is a mechanism to check for the quality of the data where the rate X means *Do not know,* which distinguishes between absence of evidence (rate 0) and lack of information on the part of the respondent. Thus, users can easily get an idea of the accuracy of collected data. The resource book provides guidance on understanding X; it suggests that if more than 40% of the responses are rated X in the assessment there is a need to find a more knowledgeable respondent (Togo & Lotz-Sisitka, 2009). Part B and C even go a step further and ask respondents to indicate whether they have adequate information about a practice, despite them having rated it. This is useful as a pointer in designing tools to collect data to support USAT assessment results, particularly evidence of existing practices identified through the assessment.

How to best use the USAT

This section explains how the USAT can best be used to achieve maximum benefit. A staged process is suggested as captured in Figure 3. These stages were developed from past experiences with the use of the tool.

Figure 3: Key steps in the use of the USAT

It is necessary for anyone wanting to make use of the USAT to read the resource book and fully understand the tool (Togo & Lotz-Sisitka, 2009). The resource book explains in detail all the parts of the tool and the indicators. While it does not provide information on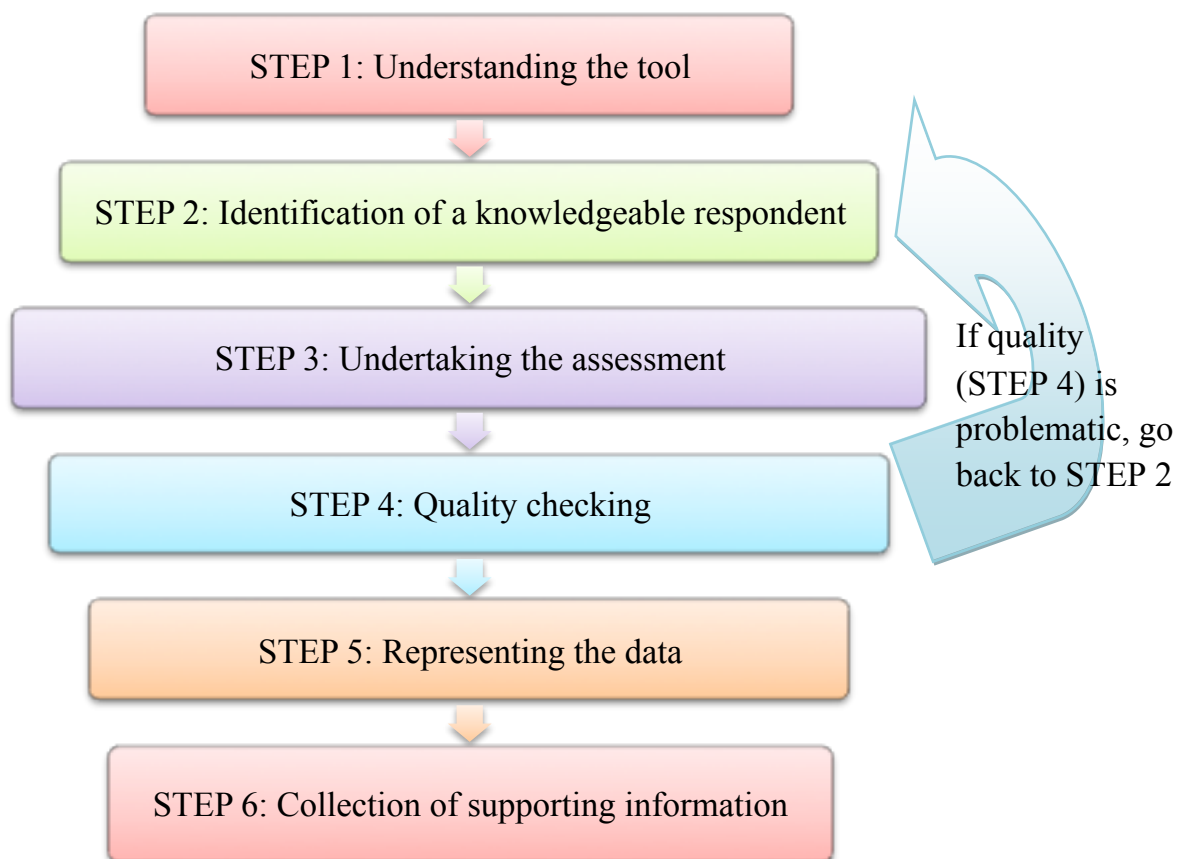 how users can get help and support when they employ the USAT in sustainability assessments, the developers of the tool have been supporting its use, formally through workshops organised as part of the MESA Universities Partnership, and informally by answering any queries by users within and outside of the MESA Universities Partnership.

The second step in using the tool is to identify a knowledgeable respondent. This depends on the level at which the tool is employed. Through pilot testing the tool by collecting data at departmental level, it was realised that the ideal people to assess sustainability are Head of Departments. Because Head of Departments have an overall understanding of departmental activities, they are logically the most suitable respondents. Though, during the use of the tool in the PhD study, there was a Head of Department who had recently been appointed from outside the university. He did not have comprehensive knowledge of departmental programmes, research and other initiatives and that made him a not so knowledgeable respondent. For that department, the deputy head was then identified as a more knowledgeable respondent. When used at faculty level, the Dean of the faculty in question will be the ideal respondent, while at programme level, it is the responsibility of the programme coordinator.

The third step is employing the USAT for assessment. While the individual undertaking the assessment may have read and understood the USAT resource book, they also need to equip the respondents with adequate information for them to correctly rate their initiatives. Thus, the best way for undertaking the assessment is a guided approach where the researcher is face to face with the respondent. That way they can go through the indicators together and the researcher can explain the indicators further if need be. However, other ways of doing the assessment can also be productive. An example is emailing the tool and having the respondents do a unguided self-assessment (see Togo & Lotz-Sisitka, 2013). Queries can also be addressed via an exchange of emails.

Just after the assessment, there is a need to check the data for quality. This is done by checking the frequency of occurrence of the rate X in the responses. For Part B and Part C assessments, a check should also be made of areas where the respondent indicated that they do not have adequate information. Where there are too many indicators rated X (i.e. 40% if a researcher decides to use the guideline in the resource book), a more knowledgeable respondent has to be found and the assessment will have to be done again. Where respondents have indicated that they do not have adequate information in the case of Part B and Part C, this can be addressed by following the assessment up by collecting additional evidence and triangulate the data, as discussed below.

The assessment is followed by an analysis and representation of the data. While the examples of different representation techniques provided in the resource book may not be exhaustive of how USAT results can be illustrated, the use of radar diagrams is probably the most adequate technique as it provides a pictorial view of the level of integration of sustainability in the different units (Togo & Lotz-Sisitka, 2009). This makes it easy to identify areas where the university is strong and where it is lacking in sustainability mainstreaming. When used, say at department or faculty level in two or more departments or faculties, multiple data sets are produced. This data need to be consolidated through calculation of average ratings for each of the indicators. The results will then be used to show institutional sustainability.

The last step, which was found to be very useful and indispensable for researchers wanting a comprehensive picture of university sustainability, is to follow up on the assessment by collecting complementing data using other data collection tools. Examples of tools that have been used are interviews, document analysis and observations. Documents that researchers need to collect are documents that give detail or elaborate on the practices identified to be in existence through the rating of indicators.

USAT data use

Data collected from the assessment can be used for any of the following purposes:

- identification of areas that require attention in terms of enhancing mainstreaming of sustainability at an institution;
- benchmarking sustainability initiatives within an institution;
- progress assessment with time, where similar assessments can be undertaken periodically and the data can be compared to original assessment data to check if there is any progress in sustainability mainstreaming;
- sustainability reporting, particularly among institutions that are using the same tool; and
- comparative analysis of initiatives and progress among different institutions or even among different departments at one institution (USAT Part A).

The benefits of using the USAT

- The USAT is easy to use. Once the respondent has a full understanding of the tool and how it can be used, they can essentially do the assessment unaided.
- The tool has in-built flexibility and assessments can be done per unit, department or programme level, allowing targeted assessments to be done, where necessary, without having to carry out a full-scale institutional assessment.
- While assessments are done at unit level, the tool still enables a whole university picture of sustainability to be built from the individual assessments.
- The use of open-ended indicators, where users can omit, add or modify existing indicators to suit their context, is also a virtue and part of the tool's in-built flexibility, as it enables the tool to be used in a variety of contexts.
- Generated data, once represented in graphs, especially radar diagrams, is easy to read and understand. High and low performance areas are easily identifiable.
- The in-built quality checking mechanism allows and enables the collection of quality and more reliable data.

The significance of the USAT in the ITP ESD-HE

Before embarking on the discussion regarding the significance of the USAT in the ITP ESD-HE, it is worth mentioning that the tool, initially developed for use in an African context, also found relevance in Asia. It was used in participating institutions in Asian countries in the same way as it was being used in Africa; essentially to identify Change Projects. At the moment, there is evidence of use of the tool in 35 institutions in Africa and Asia.

Togo and Lotz-Sisitka (2013) explain the manner in which the USAT has been employed in the MESA Universities Partnership, particularly in Africa. The paper, based on examples, discusses some of the audit findings using the tool, and how they were presented. Therefore, this section focuses on the significance of the tool in the International Training Programme, Education for Sustainable Development in Higher Education (ITP HESD) and what it enabled. Before this paper, there has so far been no attempt to come up with a comprehensive list of the universities that applied the USAT and how it contributed to their Change Projects. Table 2 in Appendix 2 lists all the institutions that employed the USAT and explains for each institution how the tool contributed to the Change Project.

The USAT was developed as part of the research support for the MESA Universities Partnership "to strengthen the MESA toolkit, and activities associated with the MESA programme" (Lotz-Sisitka & Hlengwa, 2011, p. 6). It formed an integral part of the "conceptual capital" of programme activities, allowing for "a substantive starting point and the development of a systems-based approach to the initiative" (Lotz-Sisitka & Hlengwa, 2011, p. 2). The tool is also said to have been "a central component of the success of the HESD ITP

programme" with some of its strong points in the programme being its relevance to the African context, and flexible use both in terms of targeting diverse functional structures of the university and applicability at various levels of the university (Lotz-Sisitka & Hlengwa, 2011, p. 4). Experiences from the MESA programme have already shown that "mainstreaming involved many different activities in the university, depending on focus, status and level" (Lotz-Sisitka & Hlengwa, 2011, p. 6), making the tool ideal for the programme.

A key significance of the tool in the programme is that it enables the initial auditing of practices in participating universities; thereby, facilitating the identification of Change Projects (Lotz-Sisitka & Hlengwa, 2011). Among the universities that opted to use the tool, the results of USAT audits were central to discussions that took place during the Change Project implementation phase. Thus, the tool contributed in decision-making processes, particularly research-based and informed decisions making regarding the areas to focus on in the Change Project. USAT data provided evidence that universities could use as motivation for particular Change Projects. Because it is easy to identify areas in which sustainability mainstreaming is weak from USAT results, the tool enables selection of areas in which projects have the ability to make maximum impact.

The tool also helped in streamlining the Change Projects to focus on key functions of universities. Lotz-Sisitka and Hlengwa (2011, p. 21) identify project diversity and scope to be a potential problem due to a wide range of choices, making it necessary to have "a clear framework for mainstreaming environment and sustainability". Similar to the orientation of the ITP, the foundation and design of the USAT was inclusive of "the framework of core functions of a university: teaching, research, community engagement and management", thereby helping to streamline project focus areas (Lotz-Sisitka & Hlengwa, 2011, p. 21). As Lotz-Sisitka and Hlengwa (2011) report, this has other advantages including conceptual coherence and sharing of learning experiences among projects located within similar university functions.

Concluding remarks and recommendations

The USAT proved to be an important component of the MESA ITP materials, enabling participating institutions to make research informed decisions in choosing Change Projects. Among other things, the strong points highlighted in this paper are the tool's in-built flexibility, which allows it to be used at a variety of levels (i.e. university, faculty, department or programme) and the grounding of the tool within a systems approach, which helped to shape the focus of the tool in alignment with the operational functions of universities, thus enabling streamlining the focus of Change Projects.

This chapter has not dealt with potential and experienced problem areas that emerged from the use of the tool. In addition, the chapter has not looked into the influence of the tool beyond the ITP. Going into the future, the following recommendations are suggested:
 • Getting feedback from the institutions that employed the tool, so as to document their experiences, both positive and negative, and establish ways of making it more relevant and useful beyond the DESD and the ITP.
 • Evaluation of implemented Change Projects using the tool, especially in those universities that used the tool to identify Change Projects. This will help to show the progress that has been made so far in such institutions.
 • Enhancing the accessibility of the tool. There have been queries regarding the use of the tool by individuals wanting to use it in their own research outside of the ITP.
 • Exploring ways to make the tool more user-friendly. So far, the USAT resource book is available in PDF format and does not provide access to a more user-friendly format, e.g. excel (e-worksheet). This would especially be useful for the easy capturing of assessment data and for conversion into graphic representations.
 • Providing continuous support to users. This can be done by developing a central site from which the tool is easily accessible to users and that provides a platform for questions and answers and the sharing of experiences.

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APPENDIX 1: USAT Parts A to D

A. USAT Part A. Teaching Departments

Unit-based Sustainability Assessment Tool

PART A

Teaching, Research and Community Service

Institutions / departments committed to sustainability feature certain topics in their course offerings, e.g. globalisation and sustainable development, environmental philosophy, nature writing, land ethics and sustainable agriculture, health promotion, urban ecology and social justice, population, intercultural understanding and peace, women and development, human rights, overcoming poverty, sustainable production and consumption, the role of information and communication technologies and many others (ULSF, 1999). Sustainability would be integrated into faculty and student research on topics such as renewable energy, sustainable building design, ecological economics, indigenous wisdom and technologies, population and development, and total environmental quality management (ULSF, 1999). The Unit-based Sustainability Assessment Tool is designed to assist in assessing the extent to which your department is engaging in sustainable development concerns in its teaching, research and outreach activities. It requires you to give your impression on the identified dimensions using the assessment criteria below.

Assessment Criteria

X = Don't know   no information concerning the practice

0 = None   there is total lack of evidence on the indicator

		1	=	A little	evidence show poor performance
		2	=	Adequate	evidence show regular performance
		3	=	Substantial	evidence show good performance
		4	=	A great deal	excellent performance

		Score					
Code	**Indicator**	x Don't know	0 None	1 A little	2 Adequate	3 Substantial	4 A great deal
	Curriculum						
C1	The extent to which the department offer courses that engage sustainability concerns						
C2	The level of integration of sustainability topics in courses referred to above						
C3	The degree to which local sustainability issues and challenges form part of the department's teaching programme						
C4	The degree to which global sustainability issues and challenges form part of the department's teaching programme						
C5	The extent to which the department enroll students in courses that engage sustainability concerns						
C6	The level of cross faculty collaboration in teaching sustainability programmes						
	Teaching approach **How far the teaching approach contributes to development of the following characteristics among students:**						
T7	The capacity to make informed decisions						
T8	Critical thinking skills						

T9	A sense of responsibility						
T10	Respect for the opinions of others						
T11	Integrated problem solving skills						
	Research and scholarship activities						
R12	The extent to which the department (staff and students) is involved in research and scholarship in the area of sustainability						
R13	The degree to which global sustainability issues and challenges form part of the department's research						
R14	The degree to which local sustainability issues and challenges form part of the department's research						
R15	The extent to which the department is collaborating with other faculties, institutions and stakeholders in pursuit of solutions to sustainability problems						
R16	The extent to which aspects of sustainable development are used in selection/execution of research						
R17	The level to which aspects of sustainable development are reflected in the department's research outputs						
	Community Engagement						
E18	The extent to which the department (staff and students) is involved in community engagement in the area of sustainability						
E19	The level of commitment of the department's resources in sustainability projects in the community						
E20	The degree to which local sustainability issues and challenges form part of the department's community engagement						
E21	The extent to which the department collaborates with other stakeholders in addressing community sustainability challenges						
E22	The extent to which aspects of sustainable development are used in selection/execution of community engagement projects						
	Examination (assessment) of sustainability topics						
X23	The extent to which sustainability aspects are assessed/examined during course						

X24	The extent to which sustainability aspects are considered in evaluating/assessing projects						
X25	The degree to which sustainability aspects are assessed in evaluating service learning programmes						
	Staff expertise and willingness to participate						
S26	The level of expertise of staff members in the area of sustainability						
S27	The extent to which staff members are willing to carry out research and service activities on sustainability aspects/topics						
S28	The extent to which staff members are willing to teach sustainability topics						
	Others (please specify):						

B. USAT Part B. Operations and Management

Unit-based Sustainability Assessment Tool

PART B

Operations and Management

Institutions committed to sustainability often emphasise some of the operational practices listed below (adapted from ULSF, 1999). The Unit-based Sustainability Assessment Tool helps to assess the extent to which an institution has implemented these practices using the assessment criteria below. Please complete the score sheet. Add a tick (✓) for key project areas and where more information is needed, leave blank where the practices are non-existent. Briefly indicate what you think can be done what can be done to improve the sustainability of the practice.

Assessment Criteria

X = Don't know   no information concerning the practice

0 = None   there is total lack of evidence on the indicator

1 = A little   evidence show poor performance

2	=	Adequate	evidence show regular performance
3	=	Substantial	evidence show good performance
4	=	A great deal	excellent performance

Code	Practices	Rate	Key area	Inadequate info	What can be done to improve the sustainability of the practice?
WR1	Waste reduction practices				
RW2	Recycling of solid waste (including paper, plastic, metal)				
TW3	Source reduction of toxic materials and radioactive waste				
AP4	CO_2 and air pollution reduction practices (including alternative fuel use, renewable energy sources, emission control devices)				
AQ5	Indoor air quality standards and practices				
BC6	Building construction and renovation based on ecological design principles				
EC7	Energy conservation practices (in offices, laboratories, libraries, classrooms and dormitories)				
LP8	Local food purchasing programme				
PE9	Purchasing from environmentally and socially responsible companies (including buying and using 100% post consumer chlorine free paper)				

OP10	Organic food purchasing programme				
TP11	Transportation programme (including bicycle/pedestrian friendly systems, car pools, bus pass programmes, electric/natural gas campus vehicles)				
BF12	Use of bio-fuel				
WC13	Water conservation practices (including efficient shower heads and irrigation systems)				
PM14	Integrated Pest Management practices (including reduction of pesticides to control weeds)				
SL15	Sustainable landscaping (emphasising native plants, biodiversity, minimising lawn)				
OE16	Integration of sustainability operations into the educational and scholarly activities of the university				
RB17	The presence of a body responsible for sustainable development at the institution				
SH18	Consideration of aspects of sustainability in staff hiring decisions				
OR19	Consideration of aspects of sustainable development in orientation programmes for new staff members				
ST20	Staff development in sustainable development				
RE21	Staff rewards in sustainable development				
IP22	Consideration of aspects of sustainable development in				

	institutional planning				
RF23	Allocation of research funds for sustainability projects				53
AW24	Awareness raising in sustainable development				
SV25	Visibility of sustainable development through celebration of environmental days (e.g. Arbor day, water week)				
	Others (please specify):				

C. USAT Part C. Student's Involvement

Unit-based Sustainability Assessment Tool

PART C

Student's Involvement

Institutions committed to sustainability provide students with specific opportunities and settings. They also encourage students to consider sustainability issues when choosing a career path. Conversely, students can initiate some of the activities, especially if the institution is supportive. Listed below are some of the opportunities and activities for and by students (some were adapted from the ULSF, 1999), which reflect commitment to sustainability. The Unit-based Sustainability Assessment Tool helps in assessing the degree of involvement of students in environmental and sustainability issues using the given assessment criteria. Add a tick (✓) for key areas and where more information is needed; briefly outline key activities in the area of sustainability.

Assessment Criteria

X = Don't know   no information concerning the practice

0 = None   there is total lack of evidence on the indicator

1 = A little   evidence show poor performance

2 =	Adequate	evidence show regular performance			
3 =	Substantial	evidence show good performance			
4 =	A great deal	excellent performance			

Code	Activities and opportunities	Rate	Key areas	Inadequate info	Outline of activities (what exactly is being done?)
SC1	Student Environmental Centre				
CC2	Career counselling focused on work opportunities related to environment and sustainability				
ES3	Environmental societies or other Student Group(s) with an environmental or sustainability focus				
SD4	Sustainability practices in residences or dormitories by students (e.g. recycling)				
OP5	Orientation programme(s) on sustainability for students				
SA6	Student environmental and sustainability awareness programmes				
VS7	Voluntary community service by students related to sustainability issues and concerns				
SI8	Involvement of student groups across campus in sustainability initiatives				
SR9	SRC involvement in environmental and sustainability initiatives				
SM10	Student collaboration with management in the area of				

	environmental and sustainability				
ES11	Environmental and sustainability activities initiated by students themselves (independent of departments, lecturers, management)				
SW12	Students' willingness to take responsibility in the environmental and sustainability area				
	Others (please specify):				

D. USAT Part D. Policy and Written Statements

Unit-based Sustainability Assessment Tool

PART D

Policy and Written Statements

Part D of the Unit-based Sustainability Assessment Tool focuses on integration of sustainability in higher education policy and the degree to which such higher education policy is shaped according to national and global sustainability issues. It also considers the level to which institutional policies and written statements reflect mainstream sustainability issues, and the degree to which they show commitment on the part of the university to address national and global sustainable development agendas. According to ULSF (1999), institutional commitment to sustainability can also be expressed through written statements of the mission and purpose of the institution. Rate activities and opportunities in the environmental and sustainability area by completing the score sheet. Add a tick (✓) for key areas and where more information is needed; leave blank where the practices are non-existent. Briefly outline key activities in the area of sustainability.

Assessment Criteria

X = Don't know no information concerning the practice

0 = None there is total lack of evidence on the indicator

1 = A little evidence show poor performance

2 = Adequate evidence show regular performance

3 = Substantial evidence show good performance

4 = A great deal excellent performance

Code	Practices	Rate	Key Area	Inadequate info	Elaborate on the situation	What can be done to improve the situation
PH1	The extent to which the country's HE policy reflects an engagement with sustainability concerns					
PN2	The degree to which national and global sustainability issues inform decision making processes in HE policy and structures					
PS3	The level of support given to HE institutions on sustainability programmes					
PE4	Existence of sustainability/sustainability related policies at the institution					
PR5	Integration of sustainability issues in institutional policies					
PV6	Integration of aspects of sustainable development in university vision and mission statement					
PC7	Reflection of local sustainability challenges in					

	policies and written statements					
PG8	The degree to which policies and written statements reflect national and global sustainability issues					
PI9	Implementation of policies of sustainability/sustainability related policies					
PP10	Plans to improve sustainability focus in the next policy review cycle					
	Others (specify):					

APPENDIX 2: Institutions that used the USAT

Table 2. A list of institutions that used the USAT and the contribution of the tool to institutional Change Projects

COUNTRY	INSTITUTION	YEAR	CHANGE PROJECT AND WHAT THE USAT ENABLED
Bangladesh	Ministry of Education	2012	*Participatory approach as teaching-learning strategies for ESD in Higher Education (in Teacher Education):* The USAT was used to enhance the effectiveness of teaching and learning in teacher education.
Botswana	University of Botswana	2011	*Integration of ESD into Faculty of Education Modules: In Early Childhood Education (ECD) and Education Leadership and Management (ELM) programmes*: The USAT was employed to audit the courses at UB. This led to the curriculum revision of two curriculum modules.
Cambodia	Bright Hope Institute (BHI)	2012	*Sustainable Development course at Bright Hope Institute*: The USAT was used to assess the level of integration of ESD at BHI which informed the formulation of an action plan to re-orient the current curriculum in BHI by integrating sustainable development topics like climate change adaptation and environmental transition, and to conduct teacher training, academic research and to engage the local community
Egypt	Alexandria University	2012	*Development of the Household Management curriculum (Family Sustainable Development)*: Sustainability assessment was done using the USAT in the Home Economics department. This informed change in the content of courses and the development of new applied courses
Egypt	Sohaq University	2012	*Integration of SD in teaching curriculum in Sohag University*: A USAT review indicated the Change Project could enhance focus on SD and encourage innovation and engagement of stakeholders in curriculum review. This led to re-orientation and update of the curriculum of some courses and the development of a new course with SD content.
Egypt	INSTITUTION: Mansoura University	2012	*Developing the strategic plan of Mansoura University based on sustainable development*: A USAT review was done in the university and the results showed that sustainable development was neglected component in Mansoura University. This prompted institution-wide discussion on ESD which resulted in the development of an institution wide 'Strategic Plan' for ESD.

Egypt	Helwan University	2012	*Infusion of SD concepts in the curriculum of the Tour Guidance Department at the Faculty of Tourism and Hotel Management*: An intensive USAT review was done and then the tool was used to develop applied ESD content and principles in five basic courses. The curricula in two departments have been revised and a strategy to continue revisions of the faculty curricula is in place.
Ethiopia	Bahir Dar University	2008	*Development of University mainstreaming process*: Following an assessment which employed the USAT, the results showed the need to enhance ESD content in teaching, the curriculum and research. This led to stronger institutional support for SD mainstreaming and integration of the ESD initiative into the development objectives of the institution.
Ethiopia	Wondo Genet College of Forestry and Natural Resources - Hawassa University	2011	*Improve the rigour and relevance of Forestry Education with principles of ESD*: A USAT audit was undertaken and the results were used to discuss how to improve the relevance of Forestry Education. This resulted in the development of curriculum guidelines for lecturer orientation and guidelines for ESD at institutional level. An academic paper, though not directly based on the USAT, was published in the 2011 Southern Africa Journal of Environmental Education.
Ethiopia	University of Gondar	2011	*Development of university guidelines for integrating ESD into university curricula:* A USAT analysis of 5 Faculties was done and the results influenced the development of a draft document on 'Guidelines for Integrating ESD into University Curricula' to be followed by curriculum re-orientation. A sustainability unit was established and was mandated to take the ESD project forward in the university.
Ethiopia	University of Gondar	2013	*Strengthen sustainability unit and integrating sustainability issues into different research thematic areas in the university*: The USAT was used to review ESD mainstreaming in the research and community engagement processes of the university leading to considerations to integrate sustainability in the 20 university thematic research areas or to make sustainability one independent, additional theme.
Ethiopia	Bahir Dar University	2013	*Develop an ESD Module for the Post Graduate Diploma in teaching in Ethiopia*: Sections of Part A of the USAT (teaching and curriculum approach sections) were used to assess the extent to which environmental education was being included in the teacher education curriculum in 11 programmes. This led to a process to develop one core module that all teacher education students will take, and other small modules specific to each program. A decision was also made to initiate an ESD student club where students can be supported to do ESD activities.

Indonesia	Universitas Pembangunan Nasional "Veteran" Yogyakarta	2013	*Integrating ESD concerns into the curriculum of the Department of Agrotechnology*: The results of a USAT assessment in the department was used to investigate the status of ESD and the results showed poor performance in some aspects though ESD values were found to have been integrated in academic activities, research and community services. ESD concepts, values and concerns were then integrated in a number of courses in the curriculum of the Department of Agrotechnology:
Indonesia	GadjahMada University	2013	*Acceleration Program On ESD Integration Into Higher Education Curricula Of GadjahMada University*: Initial assessment of programmes using the USAT led to the integration of sustainable development in teaching and research and community empowerment. There is now commitment to accelerate the process into higher education curricula.
Indonesia	SepuluhNopember Institute of Technology	2013	*Creating a real eco-campus through partnership among students, lecturers and staffs*: This change project was based on USAT Part B and Part C where the aim was to adapt the two parts and implement initiatives to green the campus. Also envisaged is the involvement of more students, lecturers and staffs in more universities into the project
Kenya	University of Nairobi	2008	*Re-structuring of courses in the Dept. of Agricultural Economics to include critical thinking and environmental focus*: A USAT audit of ESD practices across a number of departments in the Faculty of Agriculture indicated poor integration of environmental concerns in curricula. A need for sustainability integration was also identified in teaching, research, examinations, community engagement and assessment perspectives as well in developing capacity for critical thinking. A Certificate in Environmental and Agricultural Community Education to be offered by the University was developed.
Kenya	MasindeMuliro University of Science and Technology (MMUST)	2012	*Establishing a networked multidisciplinary ESD Community of Practice for sustainability engagements within and beyond the University*: A USAT audit showed low integration of environment and sustainability. Because of this, the focus of the project changed from the original aim to introduce a university-wide common course to focus on establishing new structures and networks for ESD first, and then to develop new policies and strategies so as to ensure more focused and coordinated action for greater ESD impact. Other options considered include greening the campus and community engagement.
Morocco	University Mohammed V Agdal, High School of Technology	2013	*Teaching capacity building based on interactive approach pedagogy, content and ICT*: The project is aimed at doing a sustainability assessment using the USAT. thematic workshops that will be based on the content of the USAT results will then be organised.

Mozambique	Catholic University of Mozambique	2012	*Integrating ESD in a BSc Agriculture Science and ensuring Green Campus at Catholic University of Mozambique*: All parts of the USAT were used to assess sustainability in the Faculty of Agriculture. Results showed the need for mainstreaming sustainability in the curriculum and for campus greening. The needs were categorised based on USAT indicators and action plans were put in place accordingly. Sustainability awareness improved the project hasn't been completed.
Nepal	University Grants Commission	2011	*Environmental guidelines for sustainable development in Nepalese Higher Education Institutions*: The USAT was adopted and adapted to develop environmental guidelines for sustainable development relevant to Nepal for application in all Nepalese Higher Education Institutions with the intention was to empower universities and affiliated colleges in environmental policy linkage and quality issues and to have a Quality Assurance and Accreditation certificate awards linked to the environmental guidelines.
Nepal	Ministry of Education (National Centre for Educational Development)	2011/ 2012	*Developing a Teacher Professional Development (TPD) manual with integrated ESD features*: The project was aimed at integrating ESD in the teacher training program after a USAT assessment showed low integration. This led to curriculum revision and training activities. Also envisaged were the development of an intensive Training Course on ESD and sustainable development to build capacity among school teachers, head-teachers and school management committee members including parents.
Philippines	Mapua Institute of Technology	2011	*Establishment of ESD Centre at Mapua Institute of Technology*: The Change Project was based on USAT assessment first in the College of Environmental Engineering, and later extended to other departments including electrical engineering. The results influenced the decision to put in place the following initiatives: a 'Sustainable Development Research Office'; a sustainable development course, carbon footprint reduction measures and sustainability networks. In addition, plans were underway to host two sustainable developing conferences.
Rwanda	Kigali Institution of Education (KIE)	2012	*Improving the Teaching of Environmental Education at the Undergraduate Level in KIE: Efforts towards Sustainable development*: A sustainability assessment using the USAT showed that while aspects of sustainable development are referred to in modules, it was still necessary to practical ways to promote sustainability issues in teaching, research, and community engagement. The USAT enabled identification of a module with environmental content to integrate social and economic environmental aspects for a holistic approach.

South Africa	University of Cape Town	2008	*Development and expansion of environmental law offerings in the law faculty (Faculty of Law)*: A USAT assessment enabled identification of environmental initiatives on campus. This resulted in the modification of the original plan to develop a multi-disciplinary programme to integrate Environmental Law across faculties; to a focus on improving the breadth and opportunities for the study of Environmental Law in the UCT Faculty of Law.
South Africa	Nelson Mandela Metropolitan University (NMMU)	2011	*NMMU Student Mobilisation Project*: An adapted version of Part C was used as a foundation for the revival and formal registration of the Green Campus Forum through as a student organisation; and the initiation of an Agent of Change leadership capacity development workshop and a newsletter. The adapted version of the USAT is also used for continuous assessment through the project's 5 phases. The process led to enhanced student engagement in sustainability issues on campus and in the community.
Sudan	University of Juba	2008	*Development of a policy document for the university on ESD in a post-conflict context (Department of Geography & whole university)*: A USAT analysis showed low integration of environment and sustainability in the university. Based on the findings, a decision was reached to develop a policy on mainstreaming sustainability into the university. However, the project was affected by other factors, he process raised environmental awareness.
Swaziland	University of Swaziland (UNISWA)	2011	*Systemic integration of environment and sustainability issues into different sub-disciplines in the Faculty of Commerce*: This project was linked to a whole institution assessment of sustainability using the USAT undertaken by the MESA implementation committee. The analysis showed low integration in in commerce. This led to initiatives like a workshop to develop a better understanding of sustainable development, staff capacity development in sustainability mainstreaming. In addition, the National Curriculum Centre has started developing textbooks that reflect ESD and the Ministry of Education and Training has prioritised ESD in its 2011 education policy.
Uganda	Mbarara University of Science and Technology	2008	*Development of materials and approaches to improve the relevance of science and technology teaching in the Education Faculty (Faculty of Education)*: An institutional USAT audit revealed relatively low levels of integration of sustainability issues in curriculum, teaching and research. Drawing on USAT findings, a framework for a course was developed with a focus on re-orientation of the methods to address community needs. Other initiatives include a lecturers training programme, an institutional workshop involving university management, staff, students and the wider community, an ESD sensitisation week. The USAT was also used to evaluate the intervention at the end of the process, showing a shift in awareness, willingness and knowledge of ESD.

Uganda	Makerere University	2011	*Integration of SD into the 'Theory and Practice of Educational Administration' and Management course outlines*: The USAT audit of different sub-disciplines in the School of Education showed poor integration of sustainability in all courses (the project was later narrowed to one course due to structural differences) and low sustainable development expertise among staff. This led to changes in course outline (enrichment) which increased student awareness and interest; and the designing of ESD Postgraduate Diploma, Masters Degree and short courses in the School of Education; and enhancement of community engagement.
Uganda	Nkumba University (NU)	2011	*Mainstreaming SD in disciplines within the School of Humanities and Sciences: Focus on Religious Education Programmes; Teacher Education Programmes; and Social Sciences*: A USAT audit in the above mentioned course led to curriculum changes in the courses, the development of a new course, and the establishment of a green foods project by students. There were plans for further community engagement projects, for the development of an ESD policy to guide on-going ESD mainstreaming.
Uganda	Busitema University(BU)	2011	*Mainstreaming ESD Principles And Practices In Teacher Education Programme (Bachelor Of Science In Education And In-Service Teacher Training Diploma)*: Based on USAT analysis results which showed low levels of sustainability integration in university programmes, and a lack of community engagement, a cross cutting course for the Bachelor of Science Education was developed. Community Engagement and student involvement were also looked into resulting in high motivation levels among students. A student Association already exist which is spear heading ESD activities in the Faculty but also linking with the community.
Uganda	Mbarara University	2008	*Development of materials and approaches to improve the relevance of science and technology teaching in the Education Faculty*: A USAT audit revealed relatively low levels of integration of sustainability issues in curriculum, teaching and research. This resulted in the development of a course intended to orient the methods to address community needs; a lecturers training programme, a multi-stakeholder workshop, an ESD sensitisation week, and other student and orientation related activities. The USAT tool was also used to evaluate the intervention at the end of the process, showing a shift in awareness, willingness and knowledge of ESD.
Vietnam	University of Natural Science	2011	*Integrating ESD In University Of Science:* The USAT as slightly modified and used within the university. It was found the Schools of Environmental Science and Material Science are paying more attention to SD than other faculties. Project outcomes include modification of teaching methods and integration of ESD concepts in teaching and research; improved students participation and enhanced awareness of community awareness of sustainability issues.

Zambia	National Institute of Public Administration	2008	*Training of Trainers on development of modules on sustainable development to integrate into current public administration programmes*: Findings of a USAT audit indicated low integration of sustainability issues in courses, administration, management and teaching practice. As a result, a decision was made to focus on staff development and to incorporate this into the Strategic Planning of the institution. This led to the development of a framework for a module on Principles of Sustainable Development with plans to run it in two of the NIPA programmes before rolling it out into other NIPA programmes.
Zambia	University of Zambia	2011	*Mainstreaming sustainability concepts in the proposed new MSc. Environmental and Natural Resource Management (ENRM) Programme*: A departmental USAT audit was undertaken; revealing that efforts to integrate sustainability were patchy and poorly connected. This led to integration of sustainability concepts into 5 of the core courses on the MSc ENRM. The project also enhanced awareness of ESD in the department.

Source: Agbedahin and Lotz-Sisitka (2014)

PART B: Whole system and whole institution change processes

Chapter 4: Rethinking Forestry And Natural Resources Higher Education In Ethiopia: An Education For Sustainable Development Perspective

Gessesse Dessie and Merfese Tadesse

(Wondo Genet College of Forestry, Hawassa University, Ethiopia)

Abstract

This article reports on an action research project to reorient forestry and natural resources higher education in Ethiopia. The study used a combination of methods, including questionnaires and secondary information, to understand the existing higher-education system in Ethiopia. Based on the initial analysis, a workshop was held to deliberate the findings and to draw up guidelines for forestry and natural resources higher education that reflect education for sustainable development (ESD) approaches. The results of the study show that the state of higher education with regard to forestry and natural resources has, in about half a century of such education, been influenced by several internal and external factors. It progressively evolved from endeavours dependent on foreign aid to a self-sufficient Ethiopian system. During this time, the structural distribution of graduates moved in emphasis from an earlier emphasis on the diploma to a BSc-level emphasis. Dttle progress has been made with regard to female graduates, student enrolment is limited and the desirability of forestry education has declined. Despite this, most of the 31 public universities in the country offer natural resources education. Curricula were found to be inadequate for the challenges of the times, as was the national demand for expert professionals. Existing epistemological foundation adheres to forestry as a commodity rather than as a social-ecological system influencing conceptual definitions of forest, forestry and forester. Within an ESD perspective, forests are identified as social—ecological systems, forestry is seen as a sustainability science and a sustainable development sector, and the forester is viewed as a systems thinker and change agent. It is agreed that higher education relating to forestry and natural resources in Ethiopia requires guidelines that encompass a non-reductionist and comprehensive disciplinary base where synergy of multidisciplinary approaches is emphasised, as in ESD. The guidelines outlined indicate how to adapt higher education in respect of forestry and natural resources to changing societal needs in Ethiopia. The emerging guidelines also point to a reorientation of academic institutional foundations and leadership and to the need for a relevant epistemological framework to guide higher-education curricula on forestry and natural resources. The emerging guidelines further stress that higher education should engage more strongly with pertinent global and national issues.

Introduction

The importance of forests for sustainable development is increasingly being recognised, not only as a source of wood and timber, but also for carbon sequestration, as a source of renewable energy, for cultural and spiritual values, and recreation, among others (Morell, 2001; Neeff, Luepke & Schoeme, 2006; Nune, Kassie & Mungatana, 2009; Dieter & Bernier, 2012). Even so, deforestation has not abated. The United Nations Environment Programme (UNEP, 2008) reports, for example, that deforestation is the most widespread environmental issue affecting the African continent.

A sound scientific base can play an invaluable role in the protection, as well as sustainable management and use, of forests (Rebugio, 1998; Werland, 2009; FAO, 2011). However, effective utilisation of this knowledge base requires 'strong' development and extension services. Worrying in this regard are reports that forestry

education and extension are weakening and declining. Declining student enrolment, dwindling education quality, and compromised practical components are but some of the issues reported (Dourojeanni, 1986; El-Lakany, 2004; Temu, Chamshama, Kung'u, Kaboggoza, Chikamai & Kiwia, 2008; Hull, 2011). Such reports and associated cases of this phenomenon (Brown, 2003; El-Lakany, 2004; Green, 2006; IFSA, 2009) call for transformations in forestry education.

The current global context, however, provides for various global and national opportunities that can help to revitalise forestry education, such as the Millennium Development Goals (MDGs), climate protocols such as Kyoto, the scientific work of the Intergovernmental Panel on Climate Change (IPCC) and the establishment of the United Nations Forum on Forests (UNFF). Nationally, the environmental policy of Ethiopia integrates environmental education in all school curricula, at tertiary level, and in courses in sustainable resources and environmental management. One of the four pillars of the recently established Ethiopian Climate-Resilient Green Economy (CRGE) strategy is protecting and re-establishing forests for their economic and ecosystem services, including carbon stocks (FDRE, 2011).

Studies reporting the weakening of forestry education, such as that of Temu et al. (2008), invariably recommend the revitalisation of forestry education. Specific approaches suggested, however, are extremely varied. There is also a lack of baseline data on the meaning(s) of quality forestry education. In addition, analysing the problem through reviews of temporal change in terms of enrolment, desirability, quality and curriculum may indicate what has happened (i.e. reveal the trend) without necessarily disclosing the reasons for the trend (Harcharik, 1995; Innes, 2009). One of the critical issues that this article responds to is the range of diverse and 'unsettled' definitions of forestry, and the implications that this can have for science and curricula (Legilisho-Kiyiapi, 2004; Miller, 2004). Meanings of 'forest', 'forestry' and 'forester' ground the epistemology of forestry education on which curricula are formulated and evaluated (Morell, 2001; Neeff et al., 2006; Orenius & Rekola, 2008). This furthermore helps to justify the relevance of forestry education in order to relieve it from the prevailing predicament of being seen as an undesirable discipline.

The relevance of forestry is furthermore confirmed by massive deforestation in recent years in Ethiopia and by contemporary national development initiatives (EFAP, 1994; WGCF-NR, 2003). Ethiopia is currently pursuing watershed-based rural development initiatives, including the construction of large-scale irrigation and hydroelectric dams (PASDEP, 2006; FDRE, 2010). This requires functioning upstream conservation schemes using forests. The urban areas, which are growing rapidly, also need forests to improve the human well-being of the urbanite by creating green spaces. Besides this, forests provide multiple ecosystem services for people living in rural areas.

In the past, the ideological stances and a sense of urgency created within the state apparatus and funding agencies pertaining to environmental problems led to top-down forestry management activities where local realities were effectively ignored (Hoben, 1995). As a result, forests have become a 'battleground' between dissatisfied local populations and the forestry departments. There was also unparalleled forest loss preceding the change in government in 1991 (Melaku, 2003). Part of the inconsistency and discontinuity in respect of the forestry sector is attributed to these situations. As a result, forestry as an economic sector lost its importance (Demel, 2004; Sisay et al., 2009), which has also influenced education. Similarly, forestry education is confronted by a lack of strategic support, diminished organisational power, and declining rigour and relevance (WGCF-NR, 2003; HESC, 2008; MoE, 2008).

Therefore, there is a need to examine the state of higher education in general and forestry education in particular in Ethiopia in order to establish a guideline that can help in the design of curricula relevant to the national need and global discourses (FDRE, 2009). This article analyses the state of Ethiopian forestry education in line with the ESD perspective and proposes guidelines for revitalising forestry education by addressing epistemological and ontological foundations with regard to definition and curriculum guidelines. Specifically, it sketches the history and desirability of the existing curriculum.

Study methods

The methods used for this study included a critical review of the system of higher education related to forestry and natural resources, with special emphasis on existing predicaments. This informed an action phase involving the development of guidelines for reorienting the system using a search conference method (O'Brien, 2001). One of the purposes of the search conference method was the participatory engagement of concerned bodies needing to develop a new strategy, direction and action. Three main steps were followed:

1. exploring experiences of higher education in forestry and natural resources by reviewing published works with the expectation of identifying major issues;
2. examining experiences from Ethiopia with regard to history, quality, desirability and curricula based on secondary information, interviews and reflections on the authors' lengthy experience of forestry and natural resources education; and
3. holding a search conference of scholars and faculty members of the College to sketch guidelines with the potential for reorienting education.

The search conference was set up to engage four pertinent issues:

1. employers' reports and concerns related to the decline of graduate competence (quality of education);
2. loss of desirability of forestry education among students joining Ethiopian universities;
3. emerging global and national opportunities that had brought forestry back into the limelight; and
4. the need increasing the visibility of Wondo Genet College of Forestry and Natural Resources (WGCFNR) (a key forestry education centre for Ethiopia) as a centre of excellence where the academic programmes are rigorous and relevant.

Three groups were formed to deliberate on one issue each:

1. adapting higher education in respect of forestry and natural resources to changing societal needs in Ethiopia;
2. necessary academic institutional foundations and leadership for the future of forestry and natural resources education; and
3. epistemological framework for higher-education curricula with regard to forestry and natural resources.

Each issue was subdivided into key discussion points and assigned measures of expected outcomes. In this regard, Issue 1 addressed:

- possible links between landmark development programmes in Ethiopia (e.g. the Growth and Transformation Plan, and the Climate-Resilient Green Economy Strategy) and the forestry sector; hence forestry education;
- the required needs of occupational competence and knowledge mix relating to future foresters;
- ways to address the dilemma of undergraduate education whether to produce subject specialists or generalists; and
- effective forestry and natural resources-related outreach programmes that academic institutions can adopt.

The group was asked to deliver the following: strategic development—academic collaboration *modalities*; occupational competence and skills mix *guidelines*; subject specialist or generalist *measures*; and forestry outreach *standards.*

Issue 2 addressed:

- establishing the need for centres of excellence for higher education in forestry and natural resources;
- types of research/theses models needed that simultaneously fulfil the quality requirement and development relevance;
- identifying strategic collaborative partners at national, regional and global level; and
- working at achieving a balance between implementing new technologies and learning from indigenous knowledge.

The group was asked to deliver the following: centre-of-excellence *measures*; research/theses *guidelines*; relevant *principles* for identifying collaborative partners; and mainstreaming indigenous knowledge *standards.*

Issue 3 addressed:

- outlining conceptual and operational definitions of 'forest', 'forestry' and 'forester' in the Ethiopian context;
- defining guiding principles in respect of forestry and natural resources education in the context of sustainable development;
- listing measures of rigour and relevance regarding higher education in forestry and natural resources in the context of changing societal demand; and
- strategising proactive forestry and natural resources education in relation to emerging challenges and as a reaction to the ongoing strategies and development endeavours.

The group was asked to deliver the following: conceptual and operational *definitions*; academic and research strategy *guidelines*; rigour and relevance quality *standards*; and dynamic curricula-implementation modalities *measures.*

Conceptual framework

Achieving a sustainable way of life requires a change of mind and heart, as well as a new sense of global interdependence and universal responsibility (ECC, 1992). It also requires interdisciplinary and problem-solving approaches in education (Clark, 2010). Forests are unique natural resource systems that involve biophysical, socio-economic and governance concerns and have a strong link with sustainability, and are continuously evolving as we understand more about our socio-environmental system (Bagheri & Hjorth, 2007).

Sustainable development involves a synergy of several knowledge systems and complex conceptual constructions covering a diversity of perspectives provided for in sustainable economic thinking and/or sustainable sciences (Munasigghe, 1994, Clark & Dickson, 2003). Complementary to this, ESD (UNESCO, 2006) recognises the interdependence of environmental, social and economic perspectives and the dependence of humanity on a healthy biosphere. It seeks to reorient education towards the needs and components of sustainable development (SD) (SWEDESD, 2008). The working definition for ESD, as used in this study, is founded on social—ecological systems thinking (e.g. Holling & Gunderson, 2002), is centred on sustainable-development ideals (e.g. Clark, 2010), and embraces adaptive management (e.g. Folke, Hahn, Olsson & Norberg, 2005) within a transformative learning approach (e.g. Mezirow, 2003). It also includes the consideration of transdisciplinary/interdisciplinary/multidisciplinary approaches, adheres to higher-education rigour and relevance measures (e.g. McKeown, 2002; Mogensen & Schnack, 2010), and aims at producing professionals that are systems thinkers and change agents (e.g. Maguire, 2000). It has been strongly recommended that the need to embed ESD in curricula include different types of knowing that embrace value-based concerns and competence development (Sleurs, 2008). Equally important are the epistemological

foundations of the curricula and course objectives viewed within a quality, relevance and social-change perspective (Bourgeault, Kuhlmann, Neiterman, & Wrede, 2008). Forestry education today requires a multidisciplinary foundation and a comprehensive approach (Brown, 2003) that can weave the knowledge from existing disciplines into new concepts and methods so as to address the many facets of sustainable development, that is, from concept to actual practice. This is similar to what ESD promotes (Sleurs, 2008); hence, ESD can potentially provide a useful conceptual framework to revitalise forestry education and address pertinent sustainable-development ideals.

The foundations of forestry education are determined by the way in which forests are defined. This influences the terms 'forestry' and 'forester', as well as the demand for sustainable development by the forestry sector. However, it is important to note that definitions and interpretations are always contentious, because meanings change over time (Evans, Carle & Del Lungo, 2009). Figure 1 shows that forests are holistic resources. In consequence, a comprehensive understanding of the value, goods and services that they render to society and the environment, as well as of their relevance to wider anthropogenic and natural landscapes and systems, is needed (FAO, 2005; Neeff et al., 2006; EEA, 2007; Temu et al., 2008). This will place the resource in a broader perspective with respect to purpose-goods/services in different temporal settings (the past, the present and the future), societal demands in respect of forests, and the ability to utilise forests wisely (UNFF, 2011). Such a contextual setting can establish forestry as a conceptual and scientific foundation for forestry education.
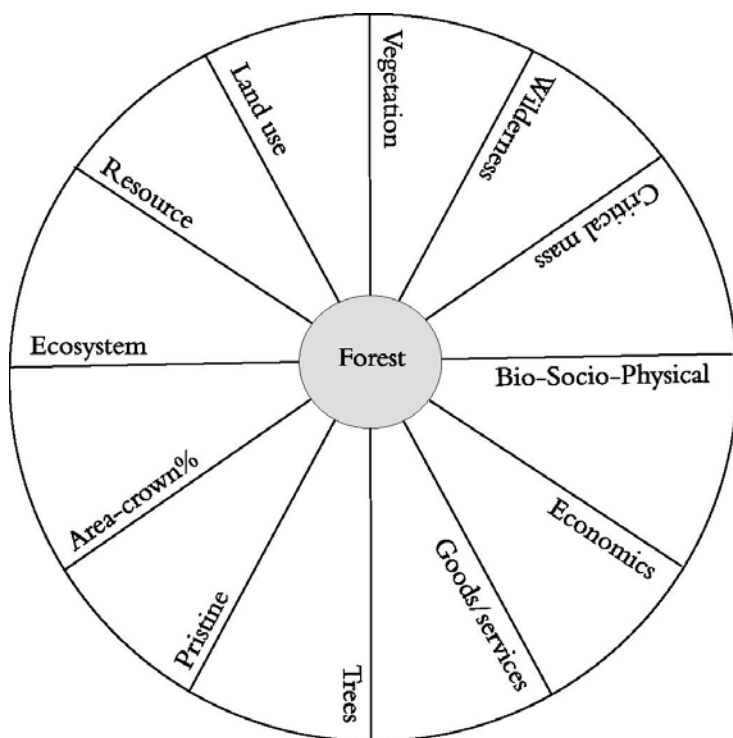
Figure 1: Comprehensive foundation for the definition of forests

As ESD is aimed at achieving sustainable development, forestry education's objective has to be sustainable forest management, because this maintains and enhances the economic, social and environmental values of all types of forests for the benefit of present and future generations (FAO, 2005). Sustainable management of forest ecosystems requires knowledge of their main functions, and of the effects of human practices on them, in order to ensure sufficient understanding of the potential long-term impacts of current practices on sustainable development. The IPCC (2007) has stated that important environmental, social and economic ancillary benefits can be gained by considering forestry-mitigation options as an element of the broad land-management plans, by pursuing sustainable-development paths, by involving local people and stakeholders, and by developing adequate policy frameworks.

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Forestry education, like any other higher-education discipline, seeks to achieve a balance between depth or breadth and the requirement of rigour, at the same time seeking relevance. While the rigour dilemma imposes challenges to promote learning that is both intellectually demanding and provides appropriate preparation for professional practice, breadth versus depth assumes that insufficient knowledge rather than inappropriate types of learning causes the theory practice gap (Brown, 2003). The checks and balances of optimal curricula involve assessing the educational dynamics of maintaining the balance between rigour and relevance, as shown in Figure 2.
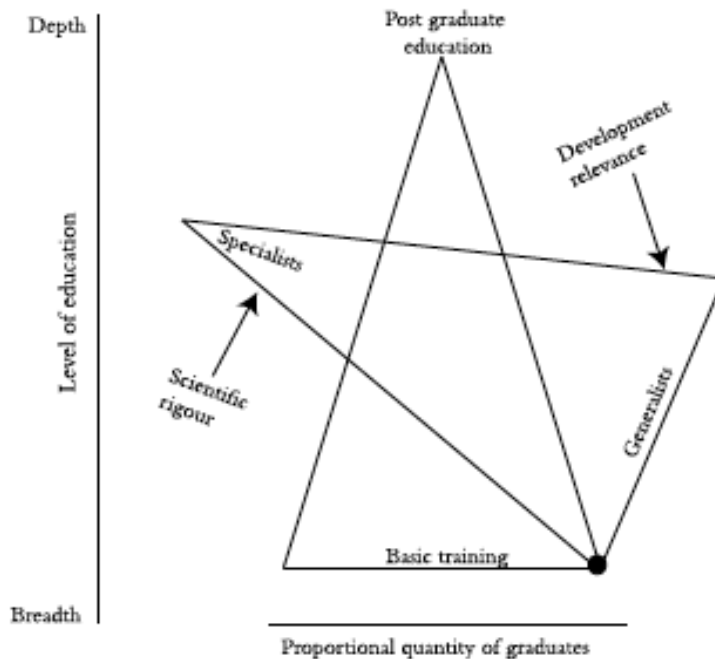

Figure 2: Conceptual foundation/checks and balances in respect of curricula formulation

Higher education in forestry and natural resources in Ethiopia

Higher education in Ethiopia

Understanding the higher-education landscape of Ethiopia is important in planning for rigour and for relevant higher education in respect of forestry and natural resources in line with ESD. In Ethiopia today, a massive expansion of tertiary-level education is under way. Between 1991 and 2008, the number of public universities increased from just two to 22 (FSS, 2009), Today, they number 31. Similarryin 2010/2011, higher-education enrolment reached over 0.46 million, 95% of which were undergraduates, 5% postgraduates (4% masters' and 1% doctoral), and 26% female (MoE, 2011). Since 2008, public universities in the country have adopted common education guidelines that contain six bands with different importance levels (MoE, 2008). The six bands are engineering and technology (40%), natural and computational sciences (20%), medicine and health sciences (5%), agriculture and life sciences (5%), business and economics (20%), and social sciences and humanities (10%). All higher-education institutions in the country have established academic management that suits this division and are designing curricula under each band (MoE, 2008). Universities are free to offer curricula from all the bands as long as they adhere to the enrolment allocations: 70% science and 30% social science and the humanities.

While this open system has given universities the freedom to choose and to ensure required minimum enrolment of students, it has undermined centres of excellence, particularly in institutions where long-standing disciplinary specialisation has existed. Furthermore, strategic disciplines which may not be desired by

students can easily be affected, as government budgets are allocated as per student numbers. One can argue that centres of excellence may, in time, survive such competition, yet existing experiences and capacities of specialised universities can erode in the process of adhering to the blanket prescription regarding higher education in the country. Massification in the form of increasing the number of universities (30 universities in 20 years) and the extent of student enrolment (half a million today) is a very considerable achievement. Nonetheless, the mismatch between required facilities and expected rigour and relevance of higher education (EFERQA, 2009) can have undesired outcomes relating to inadequate quality of graduates for development needs.

History of forestry and natural resources education

Higher education in respect of forestry in Ethiopia has, over the period of half a century, evolved from a diploma to the PhD level, is offered in three places and has been transformed from an external, fund-driven activity to one of local self-sufficiency During this time, the focus of curricula shifted from general forestry to subdivisions of programmes including agroforestry, production forestry and forest management.

The two-year diploma programme in general forestry offered by the WGCFNR was in existence for 25 years before it was officially terminated in 2004. The WGCFNR is a college that has specialised in forestry, and its offering is unlike other earlier forestry programmes located in the agriculture-focused college in Ambo. When bachelor-level forestry education commenced, its aim was to educate mature students who had completed the two-year diploma programme and who had served in the field for at least two years. This was a 'sandwich' arrangement between the SLU (Swedish University of Agriculture) and the WGCFNR, with the former controlling all academics and issuing the degree, while the latter provides physical space and some lecturers. After 45 students were trained in Swedish, East African and Ethiopian experiences, a local programme was initiated at the University of Haromaya that lasted for four batches and terminated after 120 students had graduated. Another interruption occurred here before forestry education was transferred to the WGCFNR in 1999 (see the timeline in Figure 3). The WGCFNR was one of the three founding colleges of Hawassa University when it was established in April 2000.
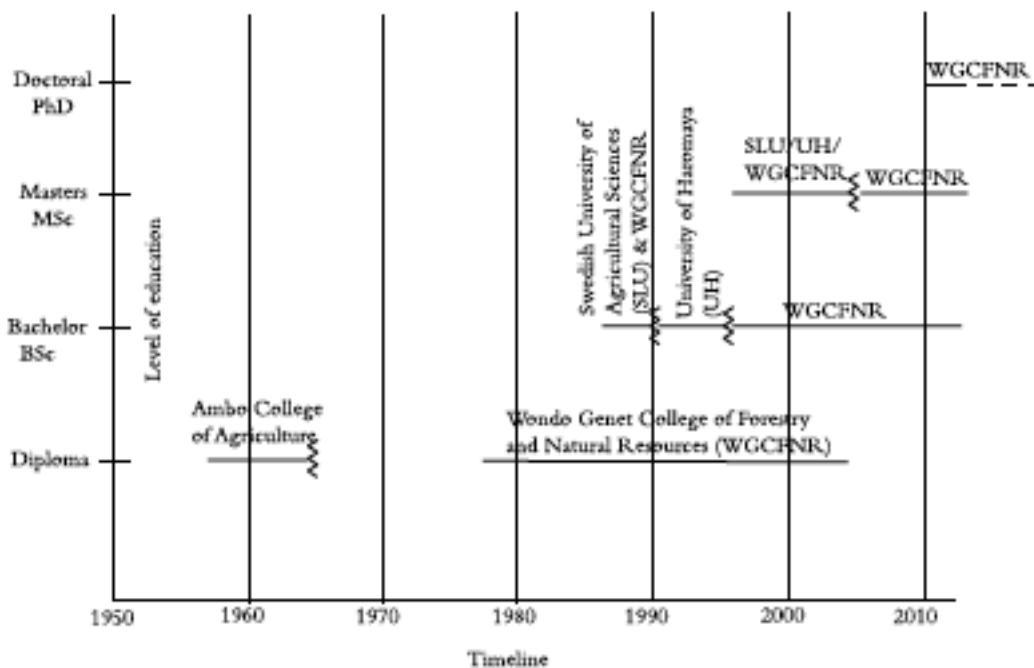

Figure 3: Timeline in respect of forestry education in Ethiopia

Postgraduate programmes were introduced in a similar way as the bachelor sandwich programme and mainly involved external lecturers in the fields of natural forest management, farm forestry and production forestry. Today, the postgraduate programme runs eight academic programmes, including climate change and development programmes.

Ethiopian forestry education is founded mainly on Swedish aid, Swedish experts and Swedish forestry practices. Swedish International Development Cooperation Agency (SIDA), which was the sole supporter of the College, invested 10 million krona per year in the College between 1987 and 2007 (SLU, 2009). Another experience that influenced forestry education in Ethiopia was African in nature and in the form of diploma-level curricula, particularly at Nyabyeya Forestry College in Uganda. Curriculum design and review are, in general, externally and internally derived. Some examples are the Ethiopian Forestry Action Plan (EFAP, 1994), a landmark forestry action plan that shaped forestry management in general and forestry education in particular, and the formation of the Ministry of Natural Resources Development and Environmental Protection immediately after the Rio Summit.

In the changing paradigm shifts, institutional memory is important yet a challenge. While adapting to the changes demands transforming curricula and scholarship, sudden shifts can derail the established epistemological foundation and institutional set-ups. The challenge here is to maintain dynamism and at the same time consistency, and continuity and at the same time stability. Figure 3 shows that forestry education in Ethiopia has undergone a progressive evolution, yet has not been free of destabilisation owing to lack of independence (being placed in the agriculture college or big universities), having to move from place to place, and instability of the employment sector.

The Ethiopian experience in respect of forestry education is not different in terms of knowledge flow from non-African foresters and comprises mainly European forestry knowledge. This has not only brought with it forest-management strategies, but has also shaped the direction in which science has developed, as scholarship is oriented through the funds made available. While productivity-based forest management was emphasised and sustainable flow of cut was targeted, sustainable forest management was not addressed. This contributed to the delinking of the forests from the ideals of sustainability without comprehensive integration of their environmental, social and economic significance. Ethiopian forestry education has, as yet, not been given an opportunity to emphasise the locally important eco-zone and indigenous forestry system of the country. Nonetheless, changes in Ethiopian forestry education curricula over time seem to correspond with paradigm shifts that involve plantation forestry, agroforestry, social forestry, community forestry, biodiversity and climate change during the past 50 years (Nair, 2008).

Distribution structure of forestry and natural resources professionals in Ethiopia

A survey of the distribution structure of professionals includes number at different levels (i.e. sufficiency) and quality in line with relevance to the types of available and emerging employment sectors. The Ethiopian forestry expert pool comprises mainly graduates from local higher-education institutions, most of whom are graduates of the WGCFNR. High-level experts at MSc and PhD levels have been educated in European and American universities, most significantly the SLU in Sweden. Figure 4 shows the distribution structure in respect of forestry experts in Ethiopia based on the total number of graduates from the WGCFNR. The figure also shows that BSc graduates constitute the larger proportion (with the number increasing), while the diploma programme was terminated in 2004. Female graduates at all levels are very small in number. The broken line is shown in order to indicate the optimal proportion of experts required, assuming that the structure tapers from the base, where more are needed at the grassroots level.

The quantitative structure pertaining to the experts in Figure 4 implicitly indicates the qualitative structure in a form of theory: practice ratio where, at the lower level for example, diploma: practical is emphasised, while theory and scientific research tend to be emphasised higher up. The termination of the diploma programme at universities, which was moved to the technical and vocational schools, implied de-emphasis of the practical component of education in universities. While this can be seen as a 'shift of place', the shift has failed to address the type of education university diplomas used to offer.
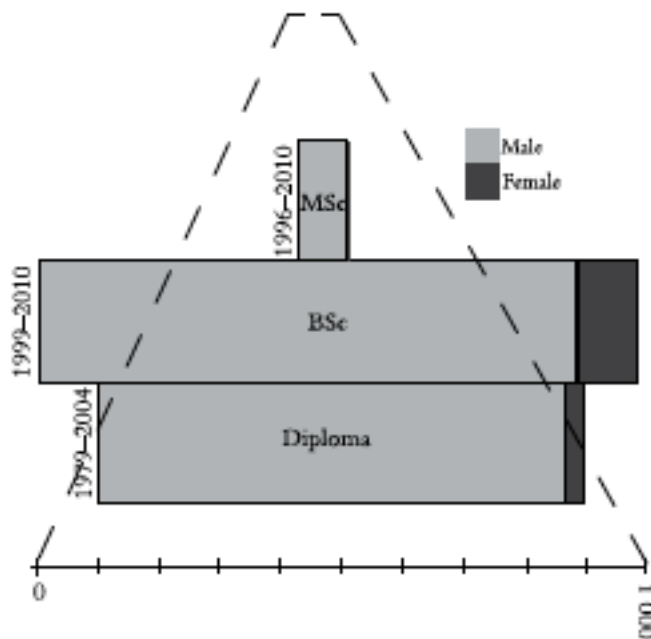
Figure 4: Sample structure of forestry experts distribution in Ethiopia

In order to plan for the future, in addition to the structure in the form of proportional number of experts, it is important to consider the number of graduates. This is determined not only by the existing employment capacity of the sector, as this can be reactive, but also by assessing future demand and needs, including changes in emphasis and direction.

Student enrolment in forestry and natural resources education

Examining the enrolment level with regard to academic programmes can on the one hand indicate the priority given by government as well as highlight the employing sectors' preferences. On the other hand, it emphasises the future prospects of the programmes. As indicated above, the Ethiopian government's 70:30 ratio undermines agricultural education in general and forestry education in particular. For example, forestry education is part of the Agriculture and Life Sciences Programme, together with resources management and natural resource economics. The number of students allocated for forestry and natural resources is 8% of the target share of students under the Agricultural and Life Sciences Programme, to be shared by all public universities offering forestry and natural resources education. Currently, the students enrolled in the forestry and natural resources programme are divided among 15 programmes and 22 universities (MoE, 2011). Natural resources management is most dominant among all bachelor programmes and is provided for in 14 out of 22 universities, while three universities each offer forestry, soil resources and watershed management, and wildlife management.

Desirability of forestry and natural resources education

Examining desirability from the students' perspectives can highlight the prevailing perception about the academic programme that is often held based on employment prospects, personal benefits and career development. Low desirability can have a lasting impact on the future of forestry and natural resources education, among other things because low-performing students who cannot enter other popular disciplines tend to be those who enrol. Enrolment is forced rather than desired, academically weak rather than scholastically superior, and unmotivated rather than passionate.

There is a general trend among Ethiopian university students for agriculture and natural resources education to be the least desired. Table 1 shows that the desirability of forestry is 3 to 47 for every 100 available spaces. Student enrolment for 2011/2012 at Hawassa University indicates that the desirability index of agriculture is better at 19 to 46 for every 100 available spaces. The level of desirability decreased over time for forestry from 500 to 700 applicants for every 100 spaces available when the College offered the diploma programme, particularly in the late 1970s and in the 1980s.The quality of students enrolled has also declined from a minimum 75% ESLCE (Ethiopian School Leaving Certificate Examination) score to less than 60% today (see Table 1).

Table 1: Desirability index of agriculture and natural resources education among students enrolling at Hawassa University during 2011

Educational programme	College location	Enrolled students			ESLCE points	Desirability index*
		M	F	Total		
Animal and Range Science	Hawassa	29	9	38	55.3	34
Plant Science	Hawassa	30	10	40	55.6	46
Horticulture	Hawassa	29	10	39	55.5	34
Rural Development	Hawassa	26	16	42	60.3	396
Agricultural Resource Economics and Management	Hawassa	29	9	38	55.3	400
Food Science and Post-harvest Technology	Hawassa	25	9	34	54.6	19
Human Nutrition	Hawassa	28	12	40	66.3	436
Natural Resource Economics and Policy	WGCFNR	30	10	40	55.1	47
General Forestry	WGCFNR	30	12	40	54.8	37
Geographic Information Science	WGCFNR	22	8	30	56.1	36
Forest Product Management and Utilization	WGCFNR	22	8	40	54.4	3
Agroforestry	WGCFNR	30	10	40	54.1	31
Natural Resources Management	WGCFNR	30	11	41	55.6	57
Wildlife Wetland and Fishery Management	WGCFNR	33	2	35	54.3	3
Soil Resources and Watershed Management	WGCFNR	30	10	40	54.3	12
Ecotourism and Cultural Heritage Management	WGCFNR	25	10	35	54.2	10

* Index value shows the number of students desiring the programme as the average of first, second and third choices for every 100 spaces available per programme.

Source: Hawassa University student placement data, Office of the Registrar WGCFNR.

The location of the forestry college in a forested area in a rural location contributes to low desirability in Ethiopia. Table 1 shows that agriculture that is located in a regional town had a higher desirability index compared with forestry and similar courses located at rural sites. The two places have very different indices. Agricultural Resource Economics and Management located in Hawassa has a desirability index of 400, while Natural Resource Economics and Policy located at the WGCFNR has a desirability index of 47. The location factor is further explained by a survey of Natural Resources Management students at the WGCFNR. A pairwise ranking survey of the desirability of forestry among third-year Natural Resources Management students at the WGCFNR reveals a different picture. Forestry was chosen instead of engineering, agriculture, teaching and geology, but rejected in comparison with medicine, computer/information technology, economics, law, and natural resources management. Medicine and natural resources management are highly valued disciplines. The low desirability of forestry education is not unique to Ethiopia. Several studies from different part of the world report the same trend (Brown, 2003;

Rodriguez, 2004; Temu & Kiyiapi, 2008; Wanjohi & Muthuri, 2008). This phenomenon is linked to many factors (Akande, 2008), such as lower priority given to the profession by governments, curriculum issues, minimal private involvement in forestry, lack of scholarships, and the popularity and status associated with white-collar jobs, among others.

Rigour and relevance of forestry and natural resources curricula

Rigour is generally defined as intellectual challenge and scholastic demand, while 'relevance' refers to the contribution of higher education to the economic, social and environmental advancement of the country. Experts who were interviewed asserted that one of the major problems with forestry curricula in Ethiopia is an inability to follow the frequently changing direction of forestry development. A survey evaluating forestry education in Ethiopia (HESC, 2008) showed limitations with regard to course administration, theory as opposed to practical skills, graduate competence, and mode of course delivery, instructional media and endogenous experience. The same source suggests that forestry education in Ethiopia is failing to produce experts who are committed, knowledgeable, equipped with practical skills and self-employing. There is also the issue of lack of harmonisation of curricula that gives rise to other rigour challenges (MoE, 2011).

In the Ethiopian public university system, natural resources programmes in general and forestry programmes in particular coexist mainly with conservation and economic management and utilisation (MoE, 2011). In the light of sustainable development, where three pillars are emphasised, here the social aspect seems less emphasised. However, this Ethiopian example seems universal (Vonhof, 2010). In the context of ESD, where systems thinking is important, the approach here is mainly commodity-oriented (EFAP, 1994; Demel, 2004; Gezahegne, 2008). Management is strongly emphasised in the form of forest management, natural resources management, watershed management, land management and wildlife management (Figure 5). Utilisation, the next highest, is linked with forests in the form of production, processing, harvesting and technology. Conservation and economics are linked with natural resources and the environment in the form of soil conservation and natural resources economics. The social aspects of forestry are generally absent or poorly covered.
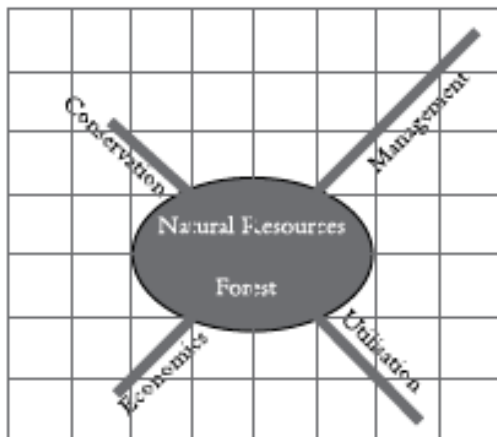
Figure 5: Scale of hybridisation of programmes and forestry and natural resources curricula at technical, bachelor's and master's level in Ethiopia

Another form of hybridisation in Ethiopia links forest with climatic conditions in the form of dry-land forestry, with mixed land uses such as agroforestry, and with settlement patterns like urban forestry (WGCFNR, 2009). This is no different from the general practices in Africa (Temu et al., 2008) that also include temporal paradigm shifts with regard to global forestry (Nair, 2008). The manner of mix is not only about combining subjects, but also about bringing together different levels, for example: introduction, basics, fundamentals, synthesis levels (including watersheds and agro forestry systems), and functional levels (including processing,

planning and management). With regard to courses, the number of subjects mixed in forestry and related areas vary between 1.93 and 2.45 (Table 2) NRE and AF respectively. While NRE emphasises one-subject courses, AF stresses courses that combine two and three subjects.

Table 2: Mix of subjects in a course and frequencies of the number of mixes for different academic programmes at the WGCFNR

Academic programmes	Number of courses	Average competence	Mix of competence			
			4	3	2	1
AF (Agroforestry)	47	2.45	6	16	18	7
FMU (Forest Management and Utilisation)	45	2.02	1	13	17	14
GF (General Forestry)	49	2.02	1	12	23	13
GIS (Geographic Information Science)	39	1.95	1	7	20	11
NRM (Natural Resources Management)	46	2.17	3	16	13	14
NRE (Natural Resources Economics)	44	1.93	1	12	14	17
SRWM (Soil Resources and Watershed Management)	41	2.07	2	13	12	14
WLM (Wildlife Management)	42	2.36	6	13	15	8

Source: Summarised from the WGCFNR academic programmes course list and description.

The table shows courses that: are non-mixed, for example introduction to *economics:* comprise two subjects, namely *remote sensing* and GIS; combine three subjects, namely *tree seed* and *nursery technology*: and integrate four subjects, namely *watershed management* and *land use planning*. The assumption is that the student needs to cover concepts and/or subjects that can be stand-alone courses in other circumstances.

By analysing the graduate profiles for programmes based on Bloom's taxonomy (Bloom, 1956), differences can be observed (see Figure 6). In NRM, more emphasis is placed on analysis, while application is minimal; in NRE more emphasis is placed on knowledge, while application is minimal. In AF and WLM, application is assigned a high value. What is interesting are FMU and GF; here, evaluation and application are strongly emphasised. The level of emphasis distinguishes generalists from specialists.

In the context of ESD, 'rigour' can mean an understanding of complexity in its heuristic nature where multidisciplinary synthesis and analysis are a prerequisite. One of the challenges here is disentangling human and environmental perspectives while at the same time comprehending the synergistic effect of the two on temporal and spatial scales. Knowing complexity on the one hand requires dynamic system-level modelling, but, on the other, demands simplified articulation of development implications to augment policy frameworks.

By the same token, 'relevance' is mainly adherence to the knowledge production in the country that supports national and local development strategies. This implicitly requires creating a critical knowledge hub and databank, understanding the field setting where the graduates are expected to operate, the institutional setting that can be elastic in order to address proactive and reactive engagements, and a system that can maintain institutional memory.
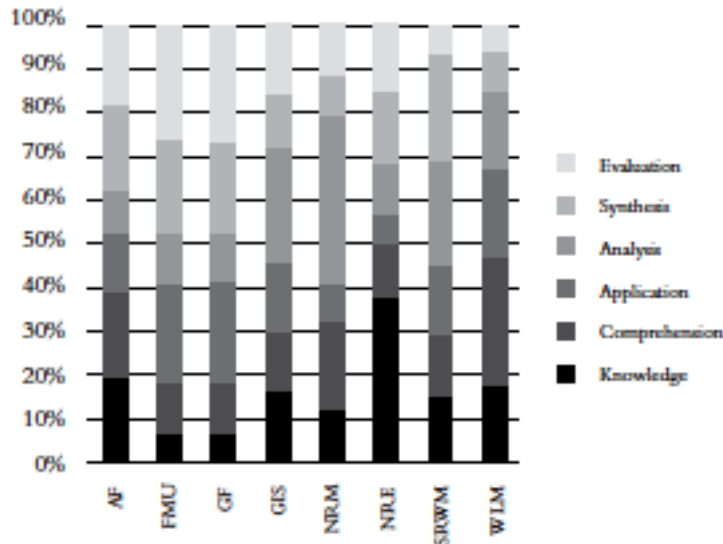
Figure 6: The level of emphasis placed on different learning outcomes by the curricula of academic programs at the WGCFNR, with reference to Bloom's taxonomy. Source: Summarised from graduate profiles stated in the curriculums of academic programmes of the WGCFNR.

Epistemological foundations of forestry and natural resources education

Texts, curricula documents, course objectives, field guides, emphasis of visits, and project plans have shown the epistemological foundation of forestry education in Ethiopia to be oriented towards productivity of forests.

The orientation is towards a plantation-prioritised knowledge system where silviculture, management, utilisation, inventory, protection and economics form the foundation of the curricula. Production per hectare in terms of volume or biomass is an important guideline, and, with it, sustainable flow of cut governs the orientation. The objectives of all the management plans of the campus forest emphasise sustainable cut rotation. Similarly, major plantation operations have been established after the natural forests were clear-felled. Moreover, graduates are trained to perform as competent field rangers equipped with practice-oriented knowledge/ skill and the behavioural orientation of exotic-tree managers.

The definition of *forest*, concepts of the forestry sector and knowledge system, and the competences of the expert and practitioner are closely linked. *Forests* are defined as commodities that are physically characterised, where forestry is considered as a stand-alone knowledge system harvested from forest land alone. 'Foresters' are specialists in respect of timber at least and trees in a given landscape at best. The Ethiopian forest sector organisation was, in the past, a commodity arrangement comprising four pillars:

1. state forests made up mainly of plantation forests and natural forests;
2. community forests encompassing community plantations and homestead trees;
3. soil and water, comprising mainly soil-conservation practices; and
4. wildlife, that is, responsibility for national parks, sanctuaries and hunting areas.

This prevailing epistemological foundation differs from what is required in the context of ESD, as shown in Table 3 below.

It has also been noted that forest systems are more likely to have sustainable outcomes with regard to high-tree species richness and subsistent livelihoods when local forest users participate in forest rule-making, whereas unsustainable forest system outcomes are more likely when users do not participate in rule-making

(Persha, Agrawal & Chhatre, 2011). Consequently, forestry changed from emphasising trees and forests to incorporating the landscape in general and social issues, as well as from wood-restricted values to environmental services (UNFF, 2011). This transformation called for sustainable forest management that defined forestry education in line with ESD.

Characteristics of such education (Table 3) include sustainable forest management thematic elements (UNFF 2006), a framework of course subjects (Langin & Ackerman, 2008; Temu & Kiyiapi, 2008; Arevalo, Pitkanen, Tahvananinen & Enkenberg, 2009), non-forestry complementarities (Temu, Okali & Bishaw, 2006), the contents of forestry curricula (Koffa & Nyenka, 2008), and non-technical knowledge (Brown, 2003; Werland, 2009). Additionally, such education needs to overcome major challenges of higher education (UNESCO, 1998) and global forest governance (Werland, 2009).

Table 3: Components of forestry education in the realm of ESD

Key areas	Descriptions
Sustainable forest management thematic elements	1. Extent of forest resources; 2. Forest biological diversity; 3. Forest health and vitality; 4. Productive functions of forest resources; 5. Protective functions of forest resources; 6. Socio-economic functions of forests; and 7. Legal, policy and institutional framework.
Forestry education framework of subjects	Fibre products, genetic resources, water quality and yield management, landscape values and environment, science and innovation, climate change, and non-wood products.
Non-forestry complementarity	Integrating social, cultural and environmental aspects.
Modern forestry education curricula	1. Public sector and community joint management of forest resources; 2. Forestry and its role in biodiversity conservation and protection; 3. Forests as recreation sites, including ecotourism; 4. Partnerships with the private sector for purposes of research, management and timber processing; 5. Forests as carbon sinks and the international implications of trading in carbon sink credits; 6. Civil society information delivery relating to forests and forestry issues; 7. Forest policy formulation and implementation; 8. Forestry education and training for non-traditional target groups; and 9. Interrelationship of forestry with other sectors such as agriculture, natural resources management, education, tourism, infrastructure and trade
Non-technical knowledge	Propositional knowledge: skilled action and deliberative analysis in decision-making, problem-solving and planning; Process knowledge: experiences, personal theories and memories; Personal knowledge: socialisation into the professional approach; and Ethical principles: gaining a sense of professional identity.
Higher-education challenges	High-quality education based on societal demands; partnerships involving higher education and the public and private sectors; innovative multidisciplinary and interdisciplinary approaches in higher education; and enhanced international cooperation and exchange in higher education.

Towards guidelines for forestry and natural resources curricula in higher education, aligned with ESD

As indicated, the analysis above informed the conference search result deliberations (see Appendix A). The conference search, in its deliberations, focused on issues of adapting higher education in respect of forestry to changing societal needs, on necessary academic institutional foundations to that end, on the desired epistemological framework for curricula, and on ensuring dynamism and continuity of programmes. The outcomes were achieved as a result of the participants' representativeness, first-hand experience, as well as practical and academic knowledge.

In addition to the wider context of forestry education as described above, and the related contours of the higher-education system, the following more specific issues arose in the plenary discussions and the search conference workshop as a whole, all of which helped to formulate the guidelines (see Appendix A for further details):

- *The role of higher education:* Universal science is, it was stated, brought about by the level of rigour of academic teaching and research, but the contribution to strategic development was emphasised in terms of relevance of the programmes and social
engagement of the higher-education institution. In this regard, the WGCFNR was criticised for not having strong units that could provide appropriate technologies, information and data to meet the serious demand in the country in relation to forestry and natural resources, implying a need for a reorientation of emphasis and a change in the institutional set-up in forestry and natural resources higher education system management towards greater emphasis on technological support and extension.

- *The role of graduates:* Expected roles for graduates were outlined as: (a) contributing to overall poverty reduction and the economic development of the country; (b) planning, managing and executing forestry activities; (c) involvement in village forestry, agroforestry, industrial forestry and environmental forestry; (d) understanding emerging forestry-related issues and converting them into action nationally; (e) being well versed in modern spatial information science and survey techniques; (f) contributing to the value-adding process in respect of forestry products and services; (g) creating networks with other professionals; and (h) working in multidisciplinary teams. These sets of roles were linked to the conceptual and operational definitions given to 'forest' and 'forestry' (see Appendix A). To strengthen the role of graduates, two important definitional elements were recommended: the legal definitions given in the country's forestry proclamation and the popular definitions as per the perceptions held in respect of forests.

- *Policy framework evaluation:* This refers to the need for engagement in critical and pragmatic evaluation of policy frameworks and strategic directions of the country. In the existing policies that govern education, the forestry sector may have limited higher-education value, but changes are already occurring at national strategic level (e.g. FDRE, 2011; FDRE, 2010). In this regard, higher education needs to adapt to the demands of such strategies in the form of green economies and sustainable development, thereby also helping to contribute to, and participate in, upscaling schemes of working forest management models, for example the participatory forest management schemes of the country.

- *Theory—practice relationship:* It was acknowledged that an imbalance between theory and abstraction at higher levels, and practice as emphasised at lower levels was occurring. A suggestion was made to reinstitute the diploma programme (Figure 4), as it had a 50% practical-education emphasis. Moreover, its success in the past had been recognised. The need for postgraduate programmes (MSc and PhD) to address the emerging demand for academicians, researchers and decision-makers was also noted. In so doing, guidelines were established for minimising trade-off and maximising synergies in the curricula-formulation processes. This involves ensuring smooth and

progressive links between undergraduate and graduate levels of education.

- *Non-reductionist approach:* It was said that an inclusive and system-oriented education in the form of ESD should be set up which also shows a deep understanding of the sector and the employment system. Higher education should not be detached from state and employer demands, and should pay attention to employers' needs and aspirations regarding graduates. A strong case was made for the introduction of quality measures and verification methods in addition to conventional criteria (HERQA, 2009). Particular mention was made of improving the quality of postgraduate theses as a way of overcoming the prevailing ethical decay. A suggestion was made that a modular research approach be introduced in which well-thought-out thematic areas, standardised methodologies, and explicit development implication measures determine theses production. The justification for this was ensuring quality, at the same time minimising theses that are shelved in libraries without practical contributions.

- *Networking:* Networking was suggested as a strategy for benefitting wisely from resources, experiences and knowledge exchange. While actively following the emerging global narrative and evolving scholarship is necessary for sharing in the universally growing knowledge field, establishing a degree of stability in accordance with the demands of the country was strongly emphasised. It was also strongly emphasised that higher-education institutions play a stronger leading role in guiding and informing forestry and natural resources knowledge management in the country.

Concluding discussion

Enrolment in forestry education has declined all over the world mainly as a result of the failure to respond adequately to rapidly changing social, economic and political environments. This seems a generally accepted notion in several forestry education studies and it tends to form the bases for revitalising the discipline in the higher-education system. Of course, it is imperative to articulate clearly what constitutes 'the decline of forestry education' before the reasons are sought and solutions prescribed.

Can forestry be a stand-alone field that can contribute reasonably to global sustainability or will it be a better contributor if linked with other disciplines technically and scientifically? Forestry as a discipline borrows its scientific foundation from many other basic sciences. At the same time, its societal benefits are judged in relation to other natural resources. Becoming a viable form of education requires clarity on the epistemology and purpose of forestry education, as outlined in this article. As shown in this study, this requires engagement with sustainable-development concerns, as well as contextual, field-specific concerns, employment and policy concerns, and practice and theoretical concerns. There is also a need for broadening from a production-only narrative guiding forestry education, to wider concerns. A review of the status of forestry education is also required in order to increase the desirability of the profession among students. In the light of the current decline in forestry education, there appears to be a pressing need for universities strong in forestry to change their vision in view of the changing knowledge and practice context. In particular, forestry education needs to embrace principles of ESD in order to play its role in responding to serious environmental concerns such as deforestation, climate change and the energy crisis. This can potentially also provide a new epistemological path for forestry education.

Forestry education is inseparable from the way forests, forestry and foresters are conceptualised. Engaging the interrelated environmental, economic and social aspects of sustainable development shifts the conceptualisation of forests from a 'plantation' to a social—ecological system with a local to global spatial setting. This gives forestry education more content, a more relevant and contemporary approach, and direction that involves multidisciplinary knowledge where the three pillars of SD are combined. This requires a new kind of curriculum that is rigorous and relevant and allows prospective foresters to attain a different knowledge, competence level, values base and skill mix from that which is currently on offer.

In conclusion, this article has sought to argue that forestry education in the context of ESD needs a different epistemological stance that outlines the necessary and sufficient conditions of knowledge, the sources of knowledge, and the structure and its limits. However, for this to come about, there is a need to fully understand the history and profile of forestry education as it currently stands, and to engage stakeholders and members of the forestry education community in reconceptualising forestry education. Moreover, it is necessary to understand the creation and dissemination of knowledge in the forestry education context. Consequently, another ontological setting is required that deals with questions concerning the forests themselves, with issues of deforestation, and with forestry education entities that exist, and how such entities can be grouped, related within a hierarchy, and engaged within the new epistemological formations based on their similarities and differences. A new conceptualisation is demanded of forestry education today.

Acknowledgements

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APPENDIX A: Suggested guidelines for reorienting forestry and natural resources higher education in Ethiopia (summary of the search conference outcomes)

Group 1: Adapting higher education in respect of forestry to changing societal needs in Ethiopia

Key discussion points	Search conference outputs
• Possible links between landmark development programmes in Ethiopia, e.g. GTP and CRGE, and the forestry sector; hence forestry education	• Producing sufficient numbers of forest professionals so that they are better able to cater for needs in respect of conserving our forests, watershed management, soil conservation, plantations, etc. • Our curriculum should contribute to the uplifting of the local community and therefore the existing curriculum has to be revised. • Being the oldest and premier institute in the field of forestry education in the country, we should take the lead in updating and having common consensus on the development of uniform curricula among various institutions and universities.
• Required needs of occupational competence and knowledge mix for future foresters	• Our curriculum should be more field-based and our students should be competent enough to solve forest-related problems, something which is lacking in the existing curriculum. • Mixing of traditional knowledge with that of the modern system of forestry education.
• Ways to address the dilemma in undergraduate education whether to produce subject specialists or generalists	• We should have a General Forestry Programme for undergraduates (broader perspective: Ethnoforestry, GIS, Watershed Management, Wildlife, etc.). • However, the programme should be extended from 3 years to 4 years.
• Effective forestry and natural resources-related outreach programmes that academic institutions can adopt	• Our research activities should focus on community issues and should be carried out with its participation, e.g. technology village. • The outreach programme should be part of our curriculum.

Group 2: Necessary academic institutional foundations and leadership to secure the future of forestry education

Key discussion points	Search conference outputs
• Establishing the need for centres of excellence for higher education in forestry and natural resources	• Go-to-place (strong service delivery). • Continuous curriculum revision that considers emerging issues (advanced knowledge). • Developing guidelines/manuals. • Alternative recruitment and promotion mechanisms (e.g. recruiting researchers through special contracts, staff incentives, etc.). • Validating studies conducted by regions and other stakeholders. • Sharing forestry knowledge with relevant institutions and partners. • Start within and extend to outside (addressing challenges within the college first). • Opening research and extension centres–where the institute has comparative advantage (e.g. GIS, environmental history, climate change mitigation, hydrology, etc.).
• Types of research/theses models needed that at the same time fulfil the quality requirement and development relevance	• Strengthening the research and extension capacity of the college. • Encouraging knowledge multiplication, as well as multidisciplinary and teamwork approach. • Publication should encourage institutional/individual collaboration. • Developing thematic research. • Modular thesis approach (to attract students and funding, and promote knowledge dissemination).
• Indicating strategic collaborative partners at national, regional and global level	• Enhancing research, teaching, and development collaboration with government and development partners. • Reviewing forestry and related curricula of other universities and taking the initiative to be a leader in advancing forest and environmental sciences.
• Achieving a working balance between implementing new technologies and learning from indigenous knowledge	• Documentation of indigenous knowledge and integrate with scientific knowledge (validating available knowledge). • Working in close relationship with local community. • Participatory research through appreciation of farmers' knowledge.

* The group suggested that the issue here should read: 'Necessary academic institutional foundations, leadership and policy to [secure] the future of forestry education'.

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Group 3: Epistemological framework for higher education curricula in respect of forestry and natural resources

Key discussion points	Search conference outputs
• Outlining conceptual and operational definitions of 'forest', 'forestry' and 'forester' in the Ethiopian context	• A forest is a parcel of land >0.5 ha, with 10% canopy cover and being above 2 m in height. • If this is the current and historical definition, the future curriculum and student in forestry and NR need to redefine it based on emerging issues related to this definition. • We define it without enough knowledge on how much is located where. The old definition of 'forest' is being/should be redefined to include: (a) restored degraded lands; (b) woodlands; (c) agroforestry; (d) areas with carbon sequestration; and (e) urban forests. This implies a multidisciplinary knowledge pool comprising: (a) ecological; (b) silvicultural; (c) economic; and (d) social. Which of these knowledge pools are drying up and which ones are emerging? This could be a basis for reviewing the existing curricula. Other issues are: land-use change has been pushing the boundary of forests for the last 50 years – (a) curricula should seek the causes and give answers; (b) students should be encouraged to provide practical solutions for these challenges; (c) how can a working definition of forests include ownership, purpose and vegetation type (name) and local knowledge; (d) a working definition that is comprehensive enough but not complete to trigger discussion and questions in academia. Forestry • Knowledge of managing forests (scientific and indigenous). • The science that deals with the interaction of forests with their biotic and abiotic elements and the people around them. • Here also, emerging science, knowledge and practice should trigger questions for academia and the curricula should try to answer. • Forestry should evolve from growing trees to sustainability of ecosystems..

Key discussion points	Search conference outputs
• Defining guiding principles in respect of forestry and natural resources education in the context of sustainable development	• Could start from basic biology/silviculture/systems thinking/interactions. • But the cutting edge is not to grow trees but to make them marketable in respect of services and values: This will help buffer deforestation. • Look for the intersection among the four capitals (biological, social, economic and cultural). • Do not look for fixed recommendations to optimise income, but for adaptive solutions suitable for local conditions.
• Listing measures of rigor and relevance of higher education in forestry and natural resources in the changing societal demand	• Centre of excellence. • Getting jobs for graduates. • Be able to solve practical problems. • Meet societal demands. • Create awareness about forest/forestry/ecosystems. • Evaluate the capacity of the current curricula to make the student think for long time period – modular as opposed to semester. • Involvement in macrolevel and microlevel issues: macro-earth system science and micro-ecosystem science.
• Strategising proactive forestry and natural resources education in relation to emerging challenges and as a reaction to the ongoing strategies and development endeavours	• Assessing emerging issues and their challenges. • Teaching not only subjects, but also problem-solving skills. • Teaching that is focused on mechanisms not events. • Updating with cutting-edge science. Maintaining the marriage between science and practice (especially community practice). (a) Start from what is known in both and develop to common ground. (b) Otherwise, science becomes irrelevant to people and society may no longer value science. • In creating jobs, discuss this with government departments (on a contractual basis) with a view to integrate their plan with the research plan of the university.

Chapter 5: Mainstreaming Environment And Sustainability At The University Of Botswana: Change Project Approach

M. J. Ketlhoilwe and Koketso Jeremiah

(University of Botswana, Botswana)

Abstract

Mainstreaming environment and sustainability concerns in institutions of higher learning is inevitable, especially during the UN Decade of Education for Sustainable Development 2005-2014 (UNDESD) and the subsequent years. The challenge with higher learning institutions is the established ways of curriculum development and practices that are not easy to amend, despite the fact that such institutions are fountains of new knowledge and innovations. In collaboration with the SADC Regional Environmental Education Programme (SADC REEP) and UNEP, and supported by the Swedish International Training Programme, the University of Botswana has taken the challenge to introduce environment and sustainability education into its curriculum, thereby contributing to the goals of the UNDESD and beyond. The authors used the Unit-Based Sustainability Assessment Tool (USAT), policy documents and interviews to assess the university's environmental and sustainability performance. It emerged that synergy is required to collaborate and tackle topics related to environment and sustainability concerns across faculties. Among the project outcomes is capacity building on Education for Sustainable Development (ESD) for educators, course reviews and programme development, particularly in the Faculty of Education. The initiatives of Mainstreaming of Environment and Sustainability in African Universities (MESA) project has the potential of facilitating ESD beyond the UNDESD and the post 2015 sustainable development goals. Sustaining the MESA project would facilitate the success of sustainable development goals adding impetus to sustainable development implementation and practices.

Introduction

The mainstreaming of environment and sustainability concerns across the university faculties, programmes, courses and practices anchors on informed institutional commitments. It is informed by institutional policies, drawing from national policy contexts as well as international environmental and sustainability discourses. The University of Botswana's (UB) participation in regional and international forums provides an opportunity to reflect on the extent to which environment and sustainability issues are integrated and infused into the university's curriculum and environmental practices. The University of Botswana used the Unit-Based Sustainability Assessment Tool (USAT), documents and interviews to assess its environmental and sustainability performance. The results showed that there are some faculties and departments that already tackle topics related to environment and sustainability concerns. It also emerged that there is dire need for institutional organs to collaboratively work towards strengthening what already exists and initiate mainstreaming of environment and sustainability concerns across the institution. These findings informed the review of courses and development of new programmes. The UB curriculum-based Change Project activities facilitated the establishment of the Mainstreaming Environment and Sustainability in African Universities

(MESA) programme, which is one of the milestones that contributes to the UN Decade of Education for Sustainable Development in southern Africa. The UB MESA programme is charged with curriculum and policy development issues within the SADC region.

Institutional context

The University of Botswana (UB) was established in 1982 as the first national university in Botswana. The university has a total of three campuses: one in the capital city Gaborone, one in Francistown, and another in Maun. The university is closely involved in the national development process of Botswana. In this regard, the special functions of the university are to engage in improving the quality and in expanding the quantity of the human resources needed for development, and to act as the repository of the collective knowledge and experience of the nation and the world. The first of these functions is fulfilled through the teaching programmes offered by the university and its affiliated institutions[10], leading to the awarding of degrees, diplomas and certificates. The second function is carried out individually and collectively by the staff of the university and its affiliated institutions, through research and development, consultancies and information services which they undertake (UB, 2013). The university is divided into seven faculties, namely: Business, Education, Engineering and Technology, Humanities, Science, Social Sciences and Health Sciences. The enrolment for 2013/2014 was over 15 000 students. The academic staff members stand at over 900 and the localisation rate is over 70% (UB, 2013).

The ideals of the UB were initially summed up by the former Chancellor of the Universities of Botswana and Swaziland, Sir Seretse Khama, by saying "The university must be a committed institution, committed to the fulfilment of the ambitions and aspirations of the communities it was created to serve. One of these is rapid development, another is non-racialism, and the third is simply pride in ourselves and in our past, which in turn would lead to a greater degree of self-confidence, which is one of the very basic ingredients of true independent nationhood" (UB, 2008a, p. 11). The UB's vision is to be a leading centre of academic excellence in Africa and the world. Some of its values that enhance its vision are cultural authenticity, social responsibility, internationalisation, public accountability and environmental sustainability (UB, 2013).

The discussion in this chapter focuses on the Faculty of Education, as it is hosting the MESA Chair and constitutes a MESA focal point in the southern Africa region. The Faculty of Education is one of the oldest faculties in the university. It has grown over the years in terms of student enrolment, number of departments, and number of programmes offered. In 2013, the Faculty of Education was composed of eight departments, including Adult Education, Educational Foundations, Mathematics and Science Education, Educational Technology, Human Services and Consumer Sciences Education (formerly Home Economics Education), Languages and Social Sciences Education, Physical Education and Primary Education. Almost all these departments have courses on or related to environment and sustainability. There are over twelve postgraduate programmes and a Master of Education programme with nine specialisations. Some of these specialisations are the Master of Environmental Education programme and Master of Counselling and Human Services programme. The Faculty of Education has a Postgraduate Diploma in Education (PGDE), MPhil and PhD programmes. Environmental Education is offered at MPhil and PhD level. These developments provide an ample opportunity to mainstream environment and sustainability issues in the Faculty of Education programmes.

There are also opportunities to mainstream or integrate environment and sustainability issues in other faculties and departments. For instance, the Department of Environmental Sciences in the Faculty of Sciences has courses on sustainable development and natural resources management. The faculties of

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[10] UB's affiliated institutions include the National Institutes of Health Sciences, Teacher Training Colleges and a College of Agriculture.

Business, Social Sciences, and Engineering and Technology deal with sustainability issues within their courses, providing opportunities for MESA implementation. Moreover, students are free to take elective courses from across faculties and to do research projects on environment and sustainability topics. This arrangement allows UB students an opportunity to be exposed to environment and sustainability issues while studying.

Institutional policy frameworks in support of MESA

One of the UB's values is to promote environmental sustainability by deepening awareness and ensuring environmental issues are incorporated into student learning, teaching and research; the development of environmental sustainable campuses; and through contributing to the environmental agenda in Botswana and beyond (UB, 2008a). Below are some of the enabling research offices and policies established to mainstream environment and sustainability into the university curriculum to fulfil the above mentioned value.

Office of Research and Development

The University of Botswana set up the Office of Research and Development (ORD) in 2001 with the overall goal of enabling the university to improve its research performance consonant with the university's strategic plan, *Shaping Our Future*, which is itself embedded in *National Development Plan 10* (2009) and *Vision 2016* (1997). The ORD works in collaboration with all faculties, centres, academic directorates, and the university library. The ORD works with these entities to provide strategic direction for research across the entire university. A key role of the ORD is to help UB achieve academic excellence through integrating research with teaching. Its mandate extends into the coordination of research, providing and facilitating research funding, and research training, facilitating multidisciplinary and collaborative research, development of intellectual property, and research quality assurance. Furthermore, the ORD promotes academic excellence by supporting the university's publications drive and by managing research outputs. The office has initiated an ethics review process, which is linked to that of the Botswana government as a way of enhancing quality in research while simultaneously engaging the university's stakeholders. A study by SADC REEP (Lupele, 2008), to establish MESA Chairs in SADC regions, has revealed that as a result of the ORD's focus on policies, the following are now in place:

Research and Development Policy (2002), which was developed to aid decision making, to set goals, to develop strategies, and to provide a framework for developing consistency, better quality management, accountability, and strategic direction for research activities. Its major goals are to develop a research culture that encourages and rewards excellence in research, innovation and development, build research capacity, generate resources, build knowledge that enhances teaching and outreach activities, and lead the university towards the realisation of its vision and mission. The implementation of this policy gave rise to the establishment of the Ethics Policy (UB, 2004a) and the Policy on Centres of Study (UB, 2004b).

Ethics Policy of 2004, which led to the establishment of a number of committees, resulting in improvement of quality in research. The main ethics committee is the Research Risks Committee, which oversees the operations of the three committees under it, namely the Institutional Review Board (dealing with human subjects), the Animal Care Committee and the Chemical and Other Hazards Committee.

Policy on Centres of Study of 2004 aims to improve research performance by providing a formal mechanism for encouraging and facilitating research, research training, and education in an area that cuts across traditional departmental and disciplinary boundaries. The present UB Research Strategy delineates the research themes on which research activity will focus. The Centres of Study create an opportunity for environment and sustainability-based research. For instance, a Centre for Sustainable and Renewable Energy Research has been established. The policy creates the potential for the MESA programme to operate as a Centre of Study within the UB framework.

MESA and the institutional priorities of the University of Botswana

The University of Botswana (UB) aims at promoting research to develop and generate knowledge on sustainable development. The 2005 audit of the university curriculum has indicated that almost all programmes are doing something related to sustainable development (Otlhogile and Mpuchane, 2005). The MESA project has gone a long way in strengthening teaching, research and service to the community, which are core activities of the University of Botswana. This is consistent with the university's mission and vision statements, and the Research Strategy, particularly strategic areas number three and twelve on *Environmental Studies and Natural Resources Management* and *Sustainable Development,* respectively (UB, 2008b). UB MESA research agenda and course designs are guided by UB Research Strategic themes, such as *environment systems and natural resources management*; *indigenous knowledge systems*; *minerals, water and energy research*; and *social and political development*. UB's MESA programme emphasises work-based environment and sustainability contexts. As an interdisciplinary project dealing with socio-ecological issues, it promotes awareness of, and provides leadership in responding to environmental and sustainability problems facing society. It deepens awareness and ensures that environmental and sustainability issues are incorporated into teaching and learning, research, and community engagement, as well as contributing to the UB Environmental and Sustainability Charter (2010) and Environmental Policy (2001). The project also promotes the university policy on internationalisation in the SADC region and in Africa through staff and students exchange programmes.

The MESA programme has the greatest potential to enhance teaching and learning as well as research on the environment by promoting quality in tuition, critical enquiry, independent thinking, and reflexivity. Through curriculum development and policy the MESA programme aims at promoting the graduation of confident and innovative graduates, who will be competitive locally and internationally. The MESA programme at UB has enhanced its Graduate Employability Strategy (UB, 2009). Botswana, like most of the middle income countries, has moved from a "Workforce Management model in which higher education met the government's need for specific types of employees, to a Human Resource Development model, in which higher education responds to the needs of society as a whole" (UB, 2009, p. 4). MESA enables the University of Botswana to re-evaluate "its courses, methods and activities so as to produce more broadly educated and employable citizens" (UB, 2009, p. 4)). Through the MESA programme, the university must respond to global trends such as "The Knowledge Economy" (UB, 2009, p. 5), in which the development of societies and the competitiveness of industries depend on the knowledge and skills of citizens and employees, and the ability to communicate and mobilise that knowledge. Knowledge management gives enterprises a key competitive edge, as they become "learning corporations" and respond in real time to changes in technology and consumption. Such rapid changes require individuals to embrace "lifelong learning" so as to maintain flexibility in the job market and to contribute to the production, dissemination and implementation of ideas (UB, 2009).

Rationale for the MESA programme and activities

MESA and its activities are important to the universities in Africa and the UB as it:
- ✓ supports the implementation of the UN DESD and regional plan on mainstreaming education for sustainable development issues within southern African institutions;
- ✓ facilitates the sharing of experiences and opportunities for mainstreaming emerging environment and sustainability issues in universities, with some specific focal areas such as climate change and development;
- ✓ promotes the exploration of opportunities to institutionalise the MESA programme into the institutional structures and other relevant communities of practice in ESD;
- ✓ facilitates ESD related national and regional capacity building workshops on curriculum and policy development; and
- ▪ supports a process that would lead to the establishment of collaboration with UN organs and agencies, and with other universities in Southern Africa, Africa, and internationally.

These are the main driving forces in the implementation of MESA programme activities at the University of Botswana and within the SADC region. The MESA programme is complementary to the UB policies and strategies that are aiming to establish the university as a centre of excellence in the region and beyond.

Implementing the Change Project into the university and the wider social context

To influence change at the University of Botswana is a mammoth task as there are laid out procedures and structures pertaining to programme and course introduction, review and revision. The MESA concept was introduced through the UB administrative and academic structures. It was accepted in principle at all levels as it related very well with the national environmental policies and the university vision, mission, teaching and learning policy and the research strategy, among other relevant policies. To implement the ESD project, the Dean of Education, Heads of Department (HODs) and Departmental Boards were consulted and they pledged their support. A meeting was arranged with the Deputy Vice Chancellor (Academic Affairs) and then the Vice Chancellor. After the consultation process, USAT was used across faculties and other UB organs to establish the extent to which environment and sustainability issues were practiced.

Methodology

The Change Project focussed on higher education curriculum innovation to mainstream environment and sustainability issues. This encompasses strengthening the existing programmes, courses and praxis on environmental sustainability. The project drew insights from the International Training Programme (ITP) initiative, United Nations Decade of Education for Sustainable Development (UNDESD), MESA programme and UNEP resources. It was also informed by the SADC REEP environmental education materials that provided insights into curriculum design at pedagogical level, some of which are available online. The purpose of this project was to create an opportunity to mainstream environment and sustainability concerns that are relevant to teaching, research and community engagements. The UNEP (2006) toolkit and MESA file were the main resources as they contain examples of mainstreaming environment and sustainability issues, reflecting on the pedagogical processes to highlight teaching and research content to programme/course outlines and possible community service projects.

To have an idea of the status of environment and sustainability issues in the university curriculum, data were generated from the Unit-Based Sustainability Assessment Tool (USAT), individual interviews and documents analyses. USAT questionnaires were sent through internal mail to about twenty departments, units, students' body associations, societies and clubs and the UB administration units. The response was very low across the respondents' categories. The USAT questionnaires were followed by interviews with Heads of Departments. The interviews narrowed data generation to academic departments as it was now clear that a university wide approach has some challenges and needs to be done in small steps until a satisfactory coverage is achieved. The results of the USAT described in this chapter are based on the five UB departments from the four university faculties of Education, Business, Health Sciences, and Engineering and Technology, who completed and returned the questionnaire and those who participated in an interview. The departments where the interviews were undertaken were the Departments of Languages and Social Sciences Education, Primary Education and Mathematics and Science Education. The rest of the selected potential participants did not respond to the questionnaire nor did they honour interview appointments. Through consultation with the Dean of Education and the Heads of the Department we agreed to limit the project to only five departments given the limited responses, hoping that the outcome of this project would help us make an informed decision in future.

To strengthen the USAT results, individual and unit meetings were held with staff from the seven faculties in August and September 2008. Following these meetings on mainstreaming environment and sustainability in courses, some lecturers, mostly in education departments, showed interest. These were from the Departments of Primary Education and Educational Foundations. A follow-up was made in the form of USAT and its results were incorporated into the subject's environment and sustainability assessment.

The documents analysed were mainly the university policy documents, strategies and departmental academic calendars containing course descriptions and synopsis. Policy documents analysis was done to assess enabling policy provisions to mainstream environment and sustainability concerns. The focus on programme and course descriptions was to establish existing gaps on specific courses and topics within courses on or related to environmental and sustainability concerns.

Analysis of USAT results

In terms of percentage ratings, the USAT results show that the Department of Environmental Health is leading (92%) in integrating environmental and sustainability issues. This is supported by high scores in the five areas tested, that is, in curriculum, teaching approaches, research and scholarship, examination of sustainability topics and staff expertise (see Table 1)[11].

The next department is the Department of Architecture and Planning with a rating of 81.25%. The highest scores were observed in curriculum content followed by teaching approaches. The scores declined on research/service and scholarship activities, examinations of sustainability topics, staff expertise and willingness to participate in sustainability activities. It was noted that staff participation is through membership of Non-Governmental Organisations and research.

The third department is the Department of Languages and Social Sciences Education, with an average rating of 2.19 points (43.75%). The results indicate almost a balance of scores throughout the areas of curriculum, teaching approaches, research, service and scholarship activities, examinations, and staff expertise.

The fourth department is the Department of Marketing in the Faculty of Business with 42.5% from an average score rating of 2 points. Its performance is weak in the curriculum area, but has some fluctuating scores in other areas ranging between 0 and 4 points. It performs better in the teaching approaches and research. This is an area where teachers could be innovative and infuse environment and sustainability issues.

The last department is that of Mathematics and Science Education with an overall rating of 20%. This is a department that is challenging to deal with, as members of the department seem unwilling to integrate sustainability issues for the reason that they are 'not' relevant. However, document analysis indicates that in Science and Biology Education courses there are opportunities for the integration of environment and sustainability concerns that could affect curriculum, teaching and research/service scores and rating. The USAT results indicate that the department is very weak in curriculum, in research/service and scholarship, but about average in teaching approach.

Table 1 UB Departmental sustainability performance

Code	Marketing	Architect and plan	Enviro health	DMSE	DLSSE	Total	% Rating	Average
C1	1	4	4	X	1	10	50	2
C2	1	3	4	X	2	10	50	2
C3	1	4	4	X	3	12	42	2.4

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[11] Community engagement was not tested because of lack of time as I was preparing to attend the ITP in Sweden just at the end of the University semester examinations.

C4	1	4	4	X	3	12	42	2.4
C5	X	4	4	X	X	8	50	1.6
T6	4	3	4	3	3	17	29	3.4
T7	3	3	4	3	X	13	39	2.6
T8	3	3	4	3	2	15	33	3
T9	3	2	0	4	2	11	46	2.2
T10	2	2	4	3	2	13	39	2.6
R11	2	2	4	0	2	10	50	2
R12	1	2	4	0	1	8	62.5	1.6
R13	3	2	4	X	3	12	42	2.4
R14	3	1	3	0	3	10	50	2
R15	X	2	4	0	X	6	83	1.2
E16	1	2	4	0	2	9	56	1.8
E17	1	2	3	0	2	8	62.5	1.6
S18	X	2	4	X	X	6	83	1.2
S19	3	2	4	X	3	12	42	2.4
S20	1	2	4	X	1	8	62.5	1.6
Total	34	51	74	16	35			2
% Rating	42.5	81.25	92.5	20	43.75			
Average	2	2.55	3.7	1.45	2.19			

Source: Ketlhoilwe and Jeremiah (2010)

Key for codes: C1-5 = Curriculum, T6-10 =Teaching, R1-15 = Research, E16-17= Examinations, S18-20 = Service

The results of the UB departmental sustainability audit are presented in Table 1. Some of these results are a modification of the initial ratings by the Heads of Departments (HODs) after documents analysis and follow-up interviews had been conducted. These results may change in future as more information on mainstreaming environment and sustainability issues emerges from the departments. More information is likely to be generated from interviews with respective Units Heads as USAT results and interviews revealed that some HODs were not aware of what was going on in some units as far as sustainability performance is concerned. It has become evident that some departments, such as Department of Adult Education and Department of Environmental Sciences, have integrated sustainability issues.

Outcomes of the Change Project

MESA Chair: The University of Botswana, through regional and international networking, was privileged to be among the first three universities in Southern Africa to be selected by SADC REEP to host the MESA Chair. This was in recognition of the UB being among institutions responding to the mainstreaming of environment and sustainability issues through its courses, programmes and networking within southern Africa and Africa. It was also in recognition of the UB's capability not only to mainstream environment and sustainability but also to share experiences with other institutions. UB was mandated to focus its Chair activities on curriculum innovations and policy development. The University of Swaziland was tasked to focus on industry and community engagement and the University of Zambia concentrated on teacher education and training. These MESA assignments were not limiting UB and other sister universities to focal areas, but instead encouraged collaboration in other academic areas. Most, if not all, MESA activities were done under the banner of the Chair supported by SADC REEP. The MESA Chair programme was launched in March 2010. Its activities ranged from course development and research to community engagements as illustrated in subsequent paragraphs.

Graduate programme: Since the Change Project started in 2008, its main focus was on developing a graduate programme primarily for practicing environmental and sustainability educators and practitioners, such as teachers, curriculum designers, resource developers, conservationists, socio-ecologists, development workers, decision and policy makers, writers and researchers. The Master of Education in Environmental and Sustainability Education programme is multidisciplinary in approach, drawing the content from a wide range of disciplines to enhance sustainable development. The programme aims at assisting practitioners to develop a clear conceptual framework from which they can begin to understand and evaluate the praxis of environmental and sustainability education globally and regionally in relation to their work contexts, and to be able to critically make informed choices. It was felt that this programme would be one component of the MESA Change Project that could be easily introduced within the Faculty of Education, unlike a university wide campaign to mainstream environment and sustainability concerns, which was muddled by resistance. The programme contents were informed by the gaps identified during the USAT results analysis, curriculum audit, needs assessment study and documents analysis. The main modules for the programme are Fundamental Education Research I and II, ESD, Environmental Policy Processes, Research in EE/ESD and Environmental Issues/risks. These are complemented by modules on gender, ethics, language and some optional and elective courses from across the faculties.

Capacity building: Some capacity building activities have been carried out since the project's inception. Some of the capacity building activities were done in partnership with SADC REEP. The partnership activities included workshops on climate change and development. The beneficiaries of these workshops were mainly practitioners from institutions of higher learning within the SADC region, including the MESA Chairs. The workshops drew resource persons from local institutions, SADC Secretariat, and different institutions of higher learning within SADC. This demonstrated the possibilities of networking, enhancing capabilities and

availability of expertise within the SADC region that could be utilised by MESA Chairs to enhance sustainable development initiatives.

In addition, through the UB MESA Chair, the Change Project idea was extended to an annual national course on Education for Sustainable Development. This annual course has been conducted since 2010 and participants carried out Change Projects that were presented at a national conference in July 2012. The feedback from heads of institutions indicates that the outcomes of the course are appreciated by institutions as they add value to the quality of education. Change Projects contribute to the institutions' environmental performance by reducing costs and influencing awareness on sustainable utilisation of resources. This national course on sustainable development is conducted in partnership with the Ministry of Environment, Wildlife and Tourism and the Ministry of Education and Skills Development with support from SADC REEP.

Teacher education: Mainstreaming ESD in teacher education at UB is one of the MESA programme pillars. The project's activities have made ESD an open question in curriculum innovation. New courses have been developed to support efforts in mainstreaming environmental sustainability through socio-ecological and economic contents in the university curriculum. The new courses include literature and language courses on sustainable development for the Master of Education programme in the Department of Languages and Social Sciences Education. The second course is Education for Sustainable Development for school administrators in the Department of Primary Education. The revised course for undergraduate programmes has included sustainable development and education for sustainable development. All Bachelor of Education (secondary) teacher trainees in social sciences education take core courses in environmental education. This provides them with an opportunity to be introduced to environment and sustainability issues at university level. The methodology courses expose teacher trainees to EE/ESD pedagogies, equipping them to be effective and innovative teachers upon graduation. The EE Unit in the Faculty of Education is leading the re-orientation of teacher education to address sustainability. The MESA programme has enhanced the potential of EE unit programmes and courses to bring changes within the education system that will shape the knowledge and skills of future generations in Botswana. This is realised through activities such as:
- educating new teachers;
- providing up-to-date knowledge and skills to in-service teachers;
- creating teacher education curriculum;
- providing professional development for practising teachers; as well as
- contributing to relevant teaching and learning resources development.

Based on national and UB policy contexts, teacher education curriculum re-orientation at UB ensures that innovations to mainstream environment and sustainability:
- are contextually relevant;
- are culturally appropriate;
- recognise that the local needs often have global effects and consequences; and
- deal with all three realms of SD, that is, the social (cultural and political), economic and ecological dimensions.

Environmental education curriculum re-orientation at UB includes: environmental knowledge, skills, issues, perceptions and values and their interrelationship to promote sustainability and social transformation (McKeon and Hopkins, 2002).

Research: The MESA programme is not limited to classroom mainstreaming of environment and sustainability issues. UB MESA is part of a research network within the southern Africa region engaged in ESD research on issues of education quality and relevance. An example is a research that was conducted by Ketlhoilwe and Jeremiah (Ketlhoilwe and Jeremiah, 2014). The research project was on exploring capability and agency in the context of rural women and poverty alleviation through the use of natural resources. The research examined women's capabilities and agency as a community of practitioners in their exploitation of natural resources. It explored how they perceived relevant and good quality education. It also examined different ways of learning within their communities, what they learnt, how the knowledge acquired helped them and how it is utilised to reduce poverty. The research also examined the skills acquired through social learning as

well as their coping strategies in the face of climate change. It emerged from this research that rural women learn through social, formal and informal interactions. The skills acquired included entrepreneurial skills and use of new technology. The research also revealed that some rural women have actually graduated from using natural resources to running their own small scale businesses after acquiring skills and using modern technology. This research extended MESA activities to the third part of the three focal areas of the university, as it extended into community engagement through research in the community and by providing professional services.

Community engagement: The MESA programme coordinator at the UB is a member of national panels and committees on environmental and sustainability education. The MESA Chair coordinator is the chairperson of the National Panel on Environmental Education (NPEE). The panel is an advisory body to the Ministry of Education and Skills Development on environmental education and ESD curriculum related matters. The panel is responsible for curriculum innovation to mainstream environment and sustainability issues across the curriculum. It also assists in in-service teacher education through seminars and workshops. Furthermore, the MESA Chair is a member of the NPEEC. The NPEEC is responsible for national environmental education programme and activities including the non-formal sector. The committee is housed at the Department of Environmental Affairs. One of the major annual activities of the NPEEC is the ESD change projects course. The MESA Chair is responsible for the course and its contents. The outcomes of the course include institutional based Change Projects that demonstrate innovative change in environmental practices and performance. The course emphasises change and environmental sustainability. Participants of this course are drawn from both formal and non-formal sectors, including NGOs and technical colleges. The MESA Chair has been participating effectively in this course by facilitating, monitoring and evaluating it.

Challenges and future outlook

The internal process of institutionalising the MESA programme and MESA Chair is slow. It calls for commitment from the institution and needs to take into account budgetary and fund raising implications. MESA programme implementation at UB has proved that change is possible but there are challenges, such as lack of funding and resistance from some academic departments. Funds may enable change by making it possible to access resources that make development easier. Developments that are required may include funding for publications and securing relevant resources, creation of web pages and other related teaching, learning and research supporting resources. Other financial challenges that emerged in the execution of planned activities include the development of materials, capacity building, research and financing of students' sustainability related research and community engagements projects.

The learning resources that are used by both students and educators were not designed for multidisciplinary approaches that could facilitate the mainstreaming of environment and sustainability concerns. There is dire need for educators to be familiar with the mainstreaming approaches so that they use the existing resources effectively. For this to happen, a capacity building programme for educators and learning material designers and writers is necessary for effective implementation of ESD.

Traditionally, professionals such as university lecturers are territorial when it comes to curriculum innovations. They generally view it as appearing outside their areas of specialisation. This includes some practitioners who often operate in their comfort zone. Although environment and sustainability concerns are inter- and multidisciplinary in nature, some discipline specialists still see them as add-on concepts that do not add any value to their teaching and research areas. "Faculty members often have some existing conceptions of sustainability, which may not have kept pace with the evolving nature of sustainability" (UNESCO, 2002:28). This kind of experience needs a more comprehensive understanding of sustainability and local sustainability goals. It calls for clear and concise ways of communicating about environment and sustainability. The MESA programme needs a comprehensible approach to address relevant issues and reach the right audiences. A

comprehensible re-orientation programme would address lack of understanding and awareness of sustainability concepts and may encourage those who feel that there is little or no time to work outside the box.

At the UB, like in most academic institutions, academic freedom allows for critical discourse of current knowledge and practices. The MESA programme is not escaping this practice as some academics keep on questioning its current impetus, as if it is a new phenomenon. This has provided MESA concept implementation with valuable insights that strengthen it and which add value to the teacher education programme in particular. The MESA Chair did not allow academic freedom to be an obstruction to development, but rather perceived it as an opportunity to consolidate it and re-define its justification as an innovative idea to a dynamic academic process. However, it also shows how academic freedom could be an obstruction even where the university management and policies mandate changes. MESA implementation at the UB optimised opportunities for the development of new courses and the need for recruitment of additional staff members.

Another challenge facing the programme and UB MESA Chair is shortage of manpower to create time to put more effort on MESA activities effectively. The Environmental Education Unit hosting the MESA Chair activities is faced with over enrolment of students for its undergraduate courses. This situation limits possibilities of innovative ideas that would enhance the mandate of the MESA focal point and make it more visible within the institution.

Related to shortage of human resources is limited time, given tight schedules and existing responsibilities. It is proofing to be a great challenge to focus on planning and implementing change in addition to the traditional responsibilities at the university. Traditionally, university academic staff is expected to divide their role amongst the following: teaching, research, committees work, community engagement, and advising and supervising student teachers. MESA activities are constrained to some extent by shortage of time and personnel within the EE Unit in particular.

Conclusion

MESA initiatives contributed to the implementation of the UNDESD and the Millennium Development Goals and subsequent Sustainable Development Goals. MESA implementation and progress indicates that there is potential for collaborative teaching, research and service to the community to enhance the achievability of environment and sustainability goals. A number of UB academic departments are participating in the mainstreaming of environment and sustainability issues as part of their curriculum strengthening. The 2005, 2008 and 2012 UB curriculum audit on environmental and sustainability related courses and programmes revealed that almost all faculties are doing something related to natural resources management and/or sustainable development. Regional collaborative efforts by SADC REEP to assist institutions of higher learning to mainstream environment and sustainability issues, have cascaded very well down to primary, secondary and vocational training institutes. The mainstreaming of environment and sustainability issues has also infiltrated both educational administration and the corporate world in Botswana. This was demonstrated during the Botswana National Environmental Education Conference in 2012, which was supported by SADC REEP and UB MESA Chair.

The acceptance of the MESA concept at UB strengthened the ongoing initiative in the SADC region on a ESD Researcher's Network, focusing on relevance and better quality education. The MESA activities are not limited to curriculum and development within the university, but respond to calls from national and regional demands for capacity building. The demand for capacity building on ESD calls for more resources and time. However, progress made so far indicates that the MESA concept has the potential to contribute effectively to the United Nations Decade of Education for Sustainable Development (UNDESD) within and outside of academic institutions to promote Sustainable Development Goals (SDGs). MESA has the potential to promote

better quality and relevant education in Africa. Re-orienting teacher education will take concerted effort and resources to mainstream environment and sustainability issues in curricula, programmes, practices, and policies across teacher education institutions (UNESCO, 2002).

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Chapter 6: Implementation Of The MESA Initiative In The University Of Swaziland

Mandla Mlipha

(University of Swaziland, Swaziland)

Abstract

The University of Swaziland (UNISWA) is implementing the MESA initiative with the intention of mainstreaming environment and sustainability issues in its programmes and practices. The implementation process commenced with the submission of an implementation plan for approval by management in 2009. The plan was approved in 2010 and in 2011 the MESA Implementation Committee (MIC) was appointed to spearhead the process of implementation of the MESA initiative. The MIC consists of fifteen members drawn from the seven faculties, library, management, Institute of Distance Education (IDE) and the affiliated colleges of the university. Additionally, two memberships were allocated to the Swaziland Environment Authority (SEA) and the Southern African Nazarene University (SANU). UNISWA institutionalised the MESA initiative by placing it under the Academic Development Centre. UNISWA was accorded one of the three SADC MESA Chairs, which included seed funding for the support of MESA activities. Among its activities, the MIC undertook an audit of programmes and processes to ascertain the level of integration of environment and sustainability issues. Other critical activities undertaken by the MIC included the organisation of workshops aimed at raising awareness among staff and students, training of MESA initiative leaders in two Mozambican universities, facilitating the formation of a university-wide student ESD organisation called the *Green Team,* and training of farmers on the production of mushrooms as a source of income. Most of the activities undertaken by the MIC address the challenges noted from the audit of UNISWA's programmes and processes.

Introduction

This chapter presents the MESA implementation process in the University of Swaziland (UNISWA) and affiliated institutions. The chapter starts with a description of the institutional background to contextualise the discussion of the MESA implementation process. The background includes a brief historical development of the university to its current status, including its growth in terms of faculties and student enrolment. This is followed by a motivation for the MESA initiative at UNISWA. A description of the MESA implementation process is made to highlight the various activities undertaken, as well as the policy framework guiding the process and the structures created to institutionalise the Change Project. Thereafter, the various outcomes of the MESA implementation process are presented in areas including institutional, policy, curriculum innovation, capacity building, student involvement, green campus management, research, community engagement, as well as partnership and networking. The chapter ends with a discussion of the challenges and their solutions, and the future prospects of the MESA implementation process.

Institutional background

The University of Swaziland (UNISWA) was established in 1982 making it one of the youngest universities in Southern Africa. The predecessor of the University of Swaziland was the University of Botswana, Lesotho and

Swaziland (BOLESWA), which existed up to 1975 when the National University of Lesotho (NUL) was established. The University of Botswana and Swaziland continued till 1982 when the University of Botswana (UB) and the UNISWA were established independently. Since its establishment (through Act No. 2 of 1983), UNISWA continued to grow and develop in accordance with its main aim of supporting national development objectives through academic programmes. The University of Swaziland is the largest and most influential institution of higher education in the country and wholly funded by the government of Swaziland through annual subventions. UNISWA has three campuses: Kwaluseni is the main campus hosting five of UNISWA's seven faculties; Luyengo hosts the Faculty of Agriculture; and Mbabane hosts the Faculty of Health Sciences. Student enrolment is approximately 5400 students (about 2650 males and 2750 females) and the university has an administrative and academic staff of about 350 people (about 260 locals and 93 expatriates). There are three colleges affiliated to UNISWA, mainly involved in teacher education and technical training. The current fiscal challenges experienced by the country are having a detrimental effect on the growth plans and quality of education at UNISWA. Annual subventions to UNISWA and its affiliated colleges has continued to decline over the years and reached unsustainable proportions in the 2012 / 2013 fiscal year.

The core functions of UNISWA include teaching, research and community engagement. In recent years, UNISWA staff and students have been challenged to conduct their affairs and undertake activities to respond to critical national development and sustainability challenges, which include poverty alleviation, mitigation of impacts of HIV / AIDS and climate change, food insecurity in urban and rural areas, land degradation, loss of national biodiversity, and inadequate energy sources. UNISWA staff and student organisations are involved in various community engagement activities addressing the problems mentioned above. Moreover, UNISWA's curriculum is currently being reviewed, which provides an opportunity for the integration of environment and sustainability issues. The Swaziland Education and Training Sector Policy of the Ministry of Education and Training (SETSP) embraces the concept of mainstreaming Education for Sustainable Development (ESD). Article 6.7 of the SETSP provides a policy framework for implementation of ESD in all education sectors in the country, including higher education. Thus, institutions of higher education and training are challenged to provide leadership in the implementation of the ESD in the country's education sectors. In response, UNISWA's current strategic plan articulates the institution's attempt to implement environment and sustainability issues in its programmes and practices.

Motivation for the MESA initiative at the University of Swaziland

The University of Swaziland aims to fulfil the development needs of the country in more or less all sectors. UNISWA is also expected to complement national efforts towards the implementation of the National Education Policy of 1999. Although this policy has been reviewed and replaced by the SETSP, its fundamental objectives have informed the environmental and sustainability issues contained in UNISWA's 2010-2015 Strategic Plan. The National Education Policy (1999) indicates that the government's ultimate intention is to realise graduates who can meaningfully contribute to both the cultural and economic development of the country. The desired development is closely associated with the exploitation of the fragile natural environment that needs to be protected against degradation and destruction. As mentioned above, the new SETSP has dedicated Article 6.7 to the implementation of ESD in all sectors of education in the country. In response, the 10th strategic issue in UNISWA's 2010-2011 Strategic Plan responds directly to ESD implementation, since it intends to promote environmental conservation and sustainability in UNISWA's programmes and practices. On the issue of poverty reduction, UNISWA has committed itself to spearhead community service programmes seeking for transfer of knowledge and skills to local communities. Since its full adoption at UNISWA, the MESA initiative has proved to be a medium through which UNISWA's 10th strategic issue on environment and sustainable development can de addressed.

Implementation of MESA activities at UNISWA

In 2007 a MESA implementation plan was submitted to UNISWA leadership for consideration and adoption. The plan detailed a systems approach to the implementation of the MESA initiative called *a whole university*

approach, since schedule of events and activities were to be implemented among all staff, and in all university programmes and both academic and non-academic processes (including those of affiliated institutions). The MESA implementation plan was adopted in 2009, but the implementation of recommended activities was sluggish, mainly due to a lack of requisite financial and other resources. UNISWA was accorded one of the three SADC-REEP MESA Chairs, which gave the impetus for the implementation of MESA activities through the provision of requisite financial support. Other MESA Chairs are hosted by the Universities of Botswana and Zambia.

A seminar was convened for UNISWA leadership, including senior management, Deans of faculties, Directors of centres, and Principals of affiliated colleges. The leadership of external ESD stakeholders, such as the Swaziland Environment Authority, Swaziland National Trust Commission, and Ministry of Education and Training, also participated in the seminar. The leadership seminar was designed to introduce the MESA initiative at UNISWA and in Swaziland and to sensitise institutional leaders about environment and sustainability issues. The seminar was hosted and funded by the Vice Chancellors office, which opted to host the seminar to ensure maximum participation of invited stakeholders. Thereafter, several MESA training workshops were organised for staff of UNISWA and affiliated institutions aimed at raising awareness and equipping staff about basic knowledge and understanding of environment and sustainability issues. The mainstreaming process also involved the implementation of training sessions for student leaders, including the Student Representative Councils and leaders of student clubs and societies. In addition, trainings were developed and undertaken for local subsistence farmers on sustainable sources of livelihood.

The MESA implementation plan recommended the appointment of an all-inclusive MESA Implementation Committee (MIC) to drive the process of mainstreaming of environment and sustainability at UNISWA. After consultation with relevant sectors at UNISWA and affiliated institutions, candidates were submitted to management and the Pro-Vice Chancellor appointed the MIC in January 2011. The MIC has fifteen members derived from the seven faculties, library, administration, Institute of Distance Education (IDE), four affiliated colleges and the Director of Academic Development Centre (ADC). The MIC has since accorded observer status to the Swaziland Environment Authority (SEA) and the newly established Southern African Nazarene University (SANU). The MIC is tasked with the implementation of MESA activities at UNISWA, as well as the operationalisation of the SADC-REEP MESA Chair on ESD, hereafter referred to as the UNISWA MESA Chair. The MESA initiator at UNISWA was appointed chair of the MIC and coordinator of the UNISWA MESA Chair. Nationally and regionally, the MIC has forged linkages with the Regional Centre of Expertise (RCE Swaziland), a national ESD network hosted by SEA. Through RCE Swaziland, MESA works with professional ESD organisations as well as community based organisations. Through the MIC, UNISWA has working relations with Eduardo Mondlane University and the Pedagogical University, both in Mozambique.

In its decision to adopt the MESA implementation plan, the UNISWA leadership also decided to place the MESA initiative in one of existing structures at UNISWA, a process referred to as *institutionalisation*. Institutionalisation refers to the integration of innovations or processes into the structures of the institution to access institutional support and resources, as well as facilitate reporting within the entire UNISWA structure. This was done by placing the MESA implementation process in the Academic Development Centre (ADC). The ADC was selected to house the MESA initiative based on its institutional mandate to facilitate integration of innovation and continuous capacity building of staff members. Issues and reports from the MESA implementation process are reported to the Pro-Vice Chancellor through the Director of ADC, who is also a member of the MIC.

Outcomes of the implementation process

Institutional and policy outcomes

One of the significant outcomes of the MESA implementation process is the successful institutionalisation of the initiative at UNISWA. This is a result of a leadership that is well aware of the significance to pursue environment and sustainability activities within the institution. The Academic Development Centre has since established a small MESA unit with relevant resources, including a computer to access the unit's electronic library as well as the global learning space provided by RCE Swaziland through the internet. A webpage for the MESA initiative was planned to be fully operational after approval is acquired from management. To date permission for the development of the webpage has not been granted yet.

Regarding policy, there is now a clear recognition and reference to environment and sustainability in the reviewed UNISWA's Strategic Plan for 2010 to 2015. In the tenth strategic issue UNISWA (n.d.) "intends to emphasize environmental management through making its students and staff aware of their impacts on the environment and the actions they can take to help reduce environmental degradation and destruction" (unpaged). In line with this strategic issue the university's leadership has constituted a multi-sector committee to formulate the first UNISWA environment and sustainability policy. The policy will help the institution to proactively respond to environment and sustainability issues and concerns.

Capacity building and curriculum reorientation outcomes

The MESA implementation process succeeded in raising awareness and equipping staff with basic knowledge on environment and sustainability issues. Twelve MESA training workshops for staff and student leaders were undertaken at UNISWA and affiliated institutions between October 2011 and December 2012. About 300 UNISWA staff members and about 120 staff members from the affiliated institutions were trained at UNISWA. The MESA training workshops were undertaken in a period of curriculum review at UNISWA, as the institution is transferring from a double subject major system to the more universal credit system. Academic staff participating in the workshops observed the opportunity this review presents for the integration of environment and sustainability into the curriculum.

An audit of UNISWA's programmes and processes revealed that some departments, especially those in natural sciences, already had a fair amount of content and treatment of environment and sustainability with arts and commercial faculties lagging behind (UNISWA, 2011). Currently, about three new environment and sustainability programmes are undergoing the process of approval in the Department of Environmental Health in the Faculty of Health Sciences. The Department of Geography, Environmental Science and Planning in the Faculty of Science and Engineering has included a course titled *Education for Environment and Sustainability* in its new curriculum under the credit system. The Department of Accounting in the Faculty of Commerce has structured a course titled *Green Accounting* in its curriculum, and the research agenda in the same faculty has been reviewed to include environment and sustainability. This is through the efforts of the faculty's acting Dean, who received training on environment and sustainability through SIDA's International Training Programme on ESD. The Faculties of Science and Engineering and Agriculture have a running multidisciplinary MSc programme on environmental resources management for students from Geography, Environmental Science, Animal Science, Biological Sciences, Chemistry, Crop Science and Planning.

Student involvement outcomes

The MESA implementation process has enhanced students' capacity to mainstream and undertake environment and sustainability activities. To date, two MESA training workshops were undertaken targeting students. The first workshop was held in 2011 and trained about 50 members of UNISWA's Green Team on ESD. The second workshop was held in March 2013 and trained thirty-eight members of student representative councils (SRCs) and leaders of various student clubs and societies at UNISWA and affiliated institutions. The MIC facilitated the formation and operation of the Green Team, which is a student organisation that pursues environment and

sustainability issues in the three campuses of UNISWA. The Green Team is a highly diversified organisation drawing its membership from the various student clubs and societies in all three campuses at UNISWA. The Green Team is currently spreading its tentacles to the various colleges in the country affiliated to UNISWA. With the support of the UNISWA MESA Chair, the students have successfully conducted two of their annual Green Walks aimed at sensitising the community on critical and immediate environmental and sustainability issues. The 2013 Green Walk was preceded by a panel discussion revolving around the commemoration of World Water Day, Earth Day, MESA, and climate change. The Green Walk was used to launch the students' campus sustainability project.

Green campus management outcomes

Traditionally, very few environmental and sustainability activities have been undertaken at institutional level and these were limited to on-campus symbolic and occasional tree planting sessions to commemorate certain national and global events. There is also and existing ongoing waste management system, though this simply involves collection and disposal of waste without separation, recycling or other basic treatments. However, recently students are implementing a campus sustainability project in partnership with the Swaziland Electricity Company and Swaziland Water Services Corporation to monitor the utilisation of energy and water by students. The project aims to identify magnitude of usage of the two utilities and implement corrective measures to address the situation if wastage is ascertained. While the project addresses efficient and sustainable use of energy and water, it also raises awareness among students, as the major users of such resources in the three campuses, about the importance of their conservation. The implementation of the project has triggered a lot of interest among the relevant sectors within the UNISWA structures, as well as with the national utility companies.

Community engagement outcomes

Community engagement involves the undertaking of activities to capacitate entities existing outside UNISWA. The activities involve community organisations and national institutions outside UNISWA. Using the MESA Chair seed fund, three subsistence farmers were trained on methods to produce mushrooms as a source of sustainable livelihood and they are expected to train other farmers. The three farmers were also provided with basic equipment for mushroom production to facilitate their training lessons in their community. With the use of the MESA Chair funds, the Swaziland National Trust Commission (SNTC) was assisted to formulate a strategic plan for its National Environmental Education Programme (NEEP) for 2012 to 2015. In addition, the MIC conducted fieldwork at Mpolonjeni, a rural settlement close to Mbabane, the capital city of Swaziland, and helped identify and raise awareness on a new alien and invasive plant, which was not classified among the most common problematic plants in the country.

Research and publications outcomes

An audit of UNISWA's programmes and practices showed that the institution's Research Board has recently reviewed its research agenda to include environment and sustainability issues. More than 70% of research conducted in the last ten years addresses issues related to the environment and climate change. Moreover, the Faculty of Commerce also reviewed its research agenda to mainstream environment and sustainability. Other faculties, such as Agriculture, Science and Engineering, and Health Sciences, already have a strong research orientation towards environment and sustainability issues. It is anticipated that other faculties will reorient their research to integrate environment and sustainability issues.

In most cases, the MESA initiative conducted research and produced publications through the Regional Centre of Expertise (RCE Swaziland). A landmark research by RCE Swaziland, supported by MESA, focussed on innovative approaches to access ESD for orphaned and vulnerable children in Swaziland. Results of the research were presented during the 27th EEASA conference in Botswana. The MESA initiative at UNISWA also developed publications titled *Teaching Environmental Education in Formal Schools: An*

educator's handbook and *Environmental Management and Training in Industry.* The volumes were published with the support of the UNESCO Commission in Swaziland.

The MIC also conducted a study to assess the level of integration of environment and sustainability in UNISWA programmes and processes. A report was produced in 2011, which informed the process of mainstreaming environment and sustainability at UNISWA. The study was conducted using the Unit-based Sustainability Assessment Tool (USAT) (Togo & Lotz-Sisitka, 2009). Results of the audit were shared with MESA networks nationally and internationally.

Partnership and networking outcomes

MESA is a partnership initiative that was born out of collaborative efforts by universities in Africa. In southern Africa the SADC - Regional Environmental Education Programme (REEP) is the major regional partner in the MESA implementation process. The SADC-REEP gave impetus to MESA implementation in the region by according three SADC MESA Chairs on ESD to the universities of Botswana, Swaziland and Zambia. The MESA Chairs are accompanied by crucial seed funding to support implementation of regional MESA activities. UNISWA is making concerted efforts to sustain its MESA Chair through intense resources mobilisation. The MIC has established a subcommittee responsible for this task, and alongside another subcommittee they are responsible for projects and activities. In 2011, UNISWA partnered with SADC-REEP to host two of the regional training workshops on ESD and environmental resource management for officers in agriculture, resource management, community education and conservation. In the same year, UNISWA hosted the regional RCE meeting in partnership with SADC-REEP. UNISWA is also a member of the Southern African Regional Universities Association (SARUA), whose members have tasked Deputy Vice Chancellors (DVCs) to lead university initiatives on environment, sustainable development, climate change and other related issues. An initiative by SARUA is currently being implemented by Higher Education Management Africa (HEMA) on strengthening university contributions to climate change development in southern Africa. Initial activities include a mapping study undertaken by UNISWA, through its MESA Chair, in collaboration with HEMA.

In addition, UNISWA is part of the regional environment and sustainability network through its membership in the Environmental Education Association of Southern African (EEASA). UNISWA also has close bilateral relationships with the Eduardo Mondlane and Pedagogical Universities in Mozambique, and it in multilateral linkages with Rhodes university, University of Western Cape, University of Cape Town in South Africa, University of Botswana, Chancellor College in Malawi, University of Zambia and Copperbelt University in Zambia, University of Zimbabwe, Addis Ababa University in Ethiopia, and University of Nairobi in Kenya, to name but a few.

Leadership development outcomes

Fourteen members of the MESA Implementation Committee at UNISWA and five counterparts from two Mozambican universities, participated in a MESA workshop to undergo training on leadership in the MESA initiative with the various sectors in their institutions. The workshop equipped them with approaches to institutionalise the MESA initiative in the institutions of higher education. The implementation of the MESA initiative at UNISWA has also contributed profoundly in the development of student leadership. Members of student representative councils (SRCs) at UNISWA have been trained on issues of environment and sustainability and how to organise students to form ESD clubs and organisations on their campus. The first training in 2009 resulted in the formation of the above mentioned Green Team. The MESA Chair at UNISWA also facilitated three students to undergo a leadership training in Lesotho and India. Two students in the leadership of student environmental societies on campus have participated in the annual YUVA Meet[12] in India in 2012 and 2013, respectively. Another student participated in a regional youth leadership workshop

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[12] YUVA stands for Youth Unite for Voluntary Action. Youth meet annually in India under the YUVA banner for training on leadership skills, particularly on environmentally related issues.

facilitated by SADC-REEP held in Maseru, Lesotho in 2012. Thus, the MESA initiative at UNISWA has facilitated and encouraged various activities to develop both staff and student leadership.

Challenges experienced in the implementation of the MESA programme

The first challenge encountered in the implementation of the MESA activities was the low level of awareness and lack of basic knowledge about the environment and sustainability issues among both staff and students. This state of affairs resulted in a slow recognition and uptake of initiatives aimed at mainstreaming environment and sustainability in the university's programmes and practices. The low level of awareness and lack of basic environmental knowledge was addressed through a university-wide MESA seminar for the leadership of the university. This was followed by a series of training workshops for all staff and student leadership on issues of environment and sustainability.

The second challenge experienced was a lack of people to drive the process of mainstreaming environment and sustainability in the various sectors of the university. Initially, the responsibility to implement MESA activities rested on the shoulders of two people of the MESA initiative at UNISWA. However, the establishment and training of the MESA Implementation Committee (MIC) resulted in fourteen additional individuals with capacity to facilitate mainstreaming of environment and sustainability in the various faculties and other sectors of the university.

The third challenge that was encountered during the implementation of MESA activities was the lack of financial resources. The university did not have a budget to support the implementation of MESA activities, hence the lethargic pace at which the MESA activities were implemented between 2006 and 2010. The grim financial situation was improved by the seed funds accorded to UNISWA in 2011 by SADC-REEP. This provided the necessary impetus to the implementation of MESA activities from 2011 to date. However, the challenge the MIC is currently grappling with is the sustainability of the MESA Chair funds. A MIC subcommittee has been established to mobilise resources to sustain the funds of the MESA Chair.

A fourth challenge was the absence of a policy on environment and sustainability. The lack of policy guidelines made implementation of MESA activities difficult. Instead, the MIC made reference to the university's Strategic Plan (2010-2015) for guidance in the implementation of MESA activities. The strategic plan, as noted above, clearly articulates its intention to promote environmental conservation and sustainability awareness among its students and staff.

These challenges partially emerged from the audit of UNISWA's programmes and practices undertaken by the MIC in 2013. The main recommendation of the audit report was the importance of prompt address of the identified challenges for successful and smooth implementation of the MESA activities at UNISWA. The MIC has covered quite some ground in addressing most of the recommendations contained in the report, especially in the area of sustainable funding as well as awareness raising and capacity building among staff and students.

The future outlook of the MESA implementation process

With sustainable funding, the future of the MESA implementation process at UNISWA looks promising. MESA implementation has gained popularity within the university and in the country. The mainstreaming model used in the integration of environment and sustainability issues into UNISWA programmes and practices has attracted interest from external stakeholders. For instance, the MIC has been requested to apply the mainstreaming approach and facilitate the integration of biotechnology and biosafety issues into programmes and practices of institutions of higher education and training in the country. Having made contributions to

initiatives for various stakeholders, such as the Swaziland National Trust Commission (SNTC) and subsistence farmers, the MESA implementation process envisages proving its expertise to a wider spectrum of stakeholders.

Conclusion

The MESA implementation process is well on course in the University of Swaziland and affiliated institutions. Being a small university with fewer faculties, a small staff and lower student enrolment compared to other universities in the region, made it possible for UNISWA to undertake the ambitious *whole university approach* in its mainstreaming of environment and sustainability issues. Implementation of the MESA initiative was noticeably a vehicle for UNISWA to implement its strategic objectives on environment and sustainability, while it also entrenched its influence among ESD stakeholders in the country and in the SADC region. Undoubtedly, the SADC-REEP MESA Chair funding and appointment of the MIC contributed immensely to the implementation of MESA activities at UNISWA and outside. Several successes were observed in the MESA implementation process, especially the increased level of awareness of environment and sustainability among staff and students, as well as the formulation of new programmes and courses with environment and sustainability content. Moreover, research agendas of various academic and research sectors now reflect environment and sustainable development issues. The formation of the Green Team is the highlight of students' participation in environment and sustainability issues at UNISWA. It is anticipated that their sustainability project on consumption of water and energy in the three campuses will be a success and that its results influence the institution's policies on consumption and payment of the basic utilities. The MESA implementation process continues to enjoy support of the university leadership, especially as it is now completely institutionalised and being housed in the Academic Development Centre. It is hoped that the initiative can mobilise sufficient financial resources to continue the mainstreaming of environment and sustainability in the university's programmes and practices.

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Chapter 7: Mainstreaming Education for Sustainable Development in Uganda Martyrs University: A critical analysis of the strategy

Jimmy Spire Ssentongo and Aloysius Byaruhanga

(Uganda Martyrs University, Uganda)

Abstract

It has been observed by several scholars, commentators, and sustainability-related bodies that one of the most important ways of realising sustainable development is by integrating it in both what is taught and how it is taught (pedagogy). This is because education is very important in shaping people's attitudes and informing their choices. The approach of mainstreaming Education for Sustainable Development in our education systems should rise above the traditional boundaries that build walls, which tend to limit communication between different disciplines and faculties/ schools. Yet, for this to be realised, managers of education institutions and teachers ought to be co-opted into the sustainability ideals. This chapter explains the steps that have been taken by Uganda Martyrs University towards mainstreaming Education for Sustainable Development in the university's 'way of doing things'. It also explains the challenges met, some of the achievements realised so far, and what still needs to be done.

Introduction

As Wals and Jickling (2002) observe, there are "multiple perspectives on […] education for sustainable development, and education for sustainability and multiple perspectives on the way educators should interpret these ideas" (p. 222). Although Education for Sustainability (EfS) and Education for Sustainable Development (ESD) are taken by some authors to be different in connotation (Bonnett, 2002; Wade, 2008), they will be used synonymously in this chapter. In this chapter, ESD is understood as a means of learning to deal with dilemmas in a complex societal context in which ecological, economic and sociocultural aspects are at stake and in which links between the local and the global level are made (Dam-Mieras, 2006).

This chapter mainly aims at taking the reader through the strategy and process of the Change Project that was undertaken to mainstream Education for Sustainable Development (ESD) in Uganda Martyrs University (UMU). The analysis will involve a critical reflection on all the strategy elements, that is: pre-project institutional audit, which also involved stakeholder identification, setting project objectives and developing a roadmap, and the evaluation. The assessment is formative rather than summative, because the project is still ongoing. The chapter also provides an analytical explanation of the challenges faced in the process, achievements so far realised, and prospects lying ahead.

Uganda Martyrs University

UMU is a private university that was established in 1993 by the Catholic Church, but is open to people from all religious denominations. Unlike many urban-based universities in Uganda, UMU is situated in a rural setting

along the equator surrounded by a rich biodiversity that includes a wetland, tropical vegetation, and hilly grasslands.

With a student population of 2 026 (459 reside on campus and 1 567 are distance or part-time students), the university runs seven faculties, two schools, and one institute. These are the Faculty of Agriculture, Faculty of the Built Environment, Faculty of Education, Faculty of Business Administration and Management, Faculty of Health Sciences, Faculty of Humanities and Social Sciences, Faculty of Science, East African School of Diplomacy, Governance and International Studies, Postgraduate Medical School, and the Institute of Ethics and Development Studies.

Although greenery in itself is not enough to indicate the sustainability consciousness of a university, it tells something about a university's reverence for the environment and serves to teach students and visitors the same value. UMU can be termed a green campus with a tree canopy that covers most of its lawns. However, the university still had challenges of waste management, lack of sustainability elements in some courses, lack of sustainability or (at least) an environmental policy, and the absence of well-coordinated student sustainability initiatives. As is explained here, some of these challenges remain and constitute the tasks lying ahead for our sustainability journey.

Background and rationale of the project

Education is one of the most essential tools for achieving sustainability, a state of affairs that has become a key concern globally due to the catastrophic trend that development is taking today (Dumanoski, 2009; McKeown & Hopkins, 2003). When we look around us today, we would not need to stretch much to see the "inefficient use of energy, lack of water conservation, increased pollution, abuses of human rights, overuse of personal transportation, consumerism, etc." (McKeown, 2002, unpaged). As Rappaport and Creighton (2007) put it, "what we had thought would be a problem for our children and grandchildren is a problem now, although future generations will suffer the most profound effects" (p. 2).

All these indicators of maldevelopment call educators to action. Since education, as Keating states, "is viewed as helping to provide the means to build the knowledge, skills, values and behaviours necessary for individuals, communities and nations to generate sustainable futures" (cited in Jenkins & Jenkins, 2005, p. 114). As educators, we realised the big task in front of us to ensure that the education we provide not only enhances employment prospects of our students, but that we impart skills, perspectives, and values that will guide and lead people into pursuing sustainable livelihoods and work for sustainability-oriented change within their own societies and private life.

This role that education is supposed to play should be reflected in all levels of education. Psychologists like Piaget (1970) would say that influencing the required behaviour change would call for particular focus on the lowest levels of education, because that is where foundational values are formatively acquired. However, higher education is also crucial in this task. Universities are like a learning laboratory where students experiment with a number of things as they struggle to make meaning of themselves and the world around them (Rappaport and Creighton 2007). At this level, it is assumed, students have reached a level of maturity by which they make value decisions. Therefore, it is strategic to engage with them about sustainability at this level to turn them into agents of the desired change. However, this can only be done when staff and management are brought on board as we shall illustrate in our strategy.

As a way of ensuring that education in Uganda Martyrs University (UMU) responds to the local and global concerns of sustainability, we deemed it necessary to mainstream ESD in the university. As envisioned by UNEP (2008), mainstreaming involves the three principle functions of a university, that is: teaching, research and community engagement in addition to management. Operationally, it:

involves the systematic integration of environment and sustainability concerns into a wide range of disciplines, faculties, programmes and courses in […] [the university], as well as integration of these concerns into university policies, management practices and student activities. (UNEP, 2008, p. 19)

The mainstreaming strategy that we initiated in March 2009 with the support of SIDA in the MESA programme was thus geared towards building capacity for integrating ESD in the university's policy, practice and pedagogy. Such an approach would have to see the university taking an interdisciplinary approach and ensuring that ESD is enshrined in university policy.

UMU audit and identification of the stakeholders

Before the implementation of the project, we carried out an institutional audit to establish to which extent UMU, as an institution of higher learning, had integrated ESD in its policy, operation, and educational activities and to identify the remaining gaps and challenges. As encouraged by Sterling (2005), the information and opinions gathered at this first stage provided a platform for deciding and shaping appropriate goals and objectives.

UMU's slogan is *making a difference* and its mission states it categorically that:

The wish to implement practical sustainable development in our local rural setting means that the University is committed to respectful and sound environmental management. We recognise ourselves to be part of the whole biotic community and wish to live in harmony with our environment (UMU, n.d.).

Thus, the audit sought to establish how far the *difference*, referred to in the slogan, leans to fostering sustainability and how far UMU has managed to walk its sustainability-related vision and mission. It also sought to identify the remaining tasks in this regard.

The audit covered the Institute of Ethics and Development Studies and six of the seven (at the time) faculties, namely Faculty of Humanities and Social Science, Faculty of Built Environment, Faculty of Science, Faculty of Agriculture, Faculty of Business Administration and Management, and Faculty of Education. The target was to cover all faculties, but we were limited by non-response, which was aggravated by the limited timeframe in which we were operating. These shortcomings constitute a lesson on our side, we needed to allow enough time in our strategy plan for the audit exercise, because it meant a lot to all stages that were to follow. An inadequate audit may either leave out or misrepresent some of the crucial issues for a project's success.

In the covered faculties, we mainly relied on the questionnaire method using the Unit-based Sustainability Tool (USAT)[13]. The tool has four key parts, Part A, B, C and D. Part A assesses teaching, research and community service, Part B assesses operations and management, while Part C is focused on student involvement (Togo & Lotz-Sisitka, 2009). We did not use Part D, since it did not fit into our context. The tool was found to be effective for the survey, but its structured nature was limiting in depth, especially with regard to attitudes and feelings that could only be explored qualitatively. Therefore, the exclusively quantitative approach might have affected the adequacy of the survey.

Part A was administered to the Deans and other members of academic staff within each of the faculties. Part B was administered to the university engineer, and Part C was given to student leaders within the different faculties. For Part A, though the data considered was mainly from the Deans of Faculties and Director of the Institute, the tool was also administered to other academic staff within the respective faculties in order to triangulate the data from the Deans. Part B was administered to the university engineer because his roles cut

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[13] The USAT was developed for UNEP's Mainstreaming Environment and Sustainability in African Universities partnership International Training Programme (MESA-ITP) by Togo and Lotz-Sisitka (2009). It is still being tested for validity, but we found it appropriate in its original form for use in the UMU setting.

across estates management, structural maintenance, and informing several procurement decisions. Further triangulation was done by using documentary analyses (of policy documents and faculty handbooks - outlining offered courses), observation and ad hoc interviews to crosscheck some of the USAT responses and to examine other practices related to sustainability.

The key stakeholders identified in the process were the university management, academic staff, students, and operations (engineer, procurement officers, and estates officers). The university management team is a key player in policy-making, decision-making and implementation. Academic staff members were also identified as stakeholders with regard to the curricular and pedagogical component of ESD. Students came in as the target of ESD, while operations were included for their role in purchasing, structural maintenance, procurement, and such other roles of key sustainability concerns. However, in hindsight, one key omission in the audit were the faculty administrators who are key to sustainability in the university, especially with regard to office resource use and disposal. The Estates and Procurement Departments were also not included as stakeholders, although they would have been a vital target for change. This was partly because we were trying to avoid being over-ambitious, which could have led to the failure of the initiative. However, it remains necessary that the above stakeholders are accommodated for the mainstreaming to be integral.

From the assessment, it was found that UMU has already taken some significant steps towards ESD through incorporating elements of sustainable development in its mission, through its community outreach programme, the establishment of an eco-tourism site[14], and the sustainability-oriented course units in the curriculum.[15] However, most of these steps were found to be of *silo nature* (Sterling, 2005)with a lack of horizontal coherence and, therefore, an integrated approach to ESD had to be achieved.[16]There was no ESD policy in place and it was also realised that regarding procurement and purchases UMU did not put sustainability concerns into specific consideration.

Project goal and objectives

On the basis of the institutional audit carried out, we developed the following goal and objectives. The main goal of the project is to develop capacity for mainstreaming ESD in the three main concerns of the university, namely; teaching, research, and community engagement and service.

In fulfilment of this goal, the following objectives were laid out:

- to produce course outlines for the training of management, staff and student leaders on the mainstreaming of ESD in UMU;
- to produce modules for training of Management, staff and student leaders on mainstreaming of ESD in UMU.
- to train the management, staff and student leaders for mainstreaming ESD in UMU using the relevant modules; and

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[14]The eco-tourism site was set up by the Faculty of Agriculture (FoA) as an outdoor living classroom. It is meant to serve as an environmental and development education unit for both UMU students and the surrounding community on vegetation dynamics, and to carry out laboratory tests on the water quality of the protected wetland (Ssenkungu, 2007).
[15] The courses related to sustainable development differ in number from faculty to faculty. While in some faculties they were found to be high profile and numerous, in a few others they were marginal.
[16] We took a multidisciplinary approach in the project. Different disciplines were not explicitly treated as though they were interconnected and interdependent, hence the need for an interdisciplinary approach, which is deemed appropriate for sustainability (Wade 2008) to take root in UMU's pedagogy. *Interdisciplinary* is used here to denote research and teaching strategies that brings two or more recognised academic disciplines together, with the aim of interaction and integration between methodologies, epistemological tenets, terminology and data, in an attempt to develop approaches to a common problem. *Multidisciplinary* refers to the juxtaposition of different disciplinary perspectives within a team consisting of individuals with distinct disciplinary expertise (Brooks & Ryan, 2008).

▪ to initiate the policy changes required to bring about the mainstreaming of ESD in Uganda Martyrs University.

Project implementation

The project was implemented through four principle phases. Phase one involved developing course outlines and putting together training materials. Phase two entailed training the university Management Committee, selected academic staff (who were supposed to later train their faculty members), and student leaders. Phase three comprised of an assessment of the implementation process (mainly the trainings). In phase four, which is still ongoing, the UMU ESD policy is being worked out.

Phase 1: Developing course outlines and selecting training materials (July 2009)

The prepared materials included modules, cartoon posters and relevant literature to be used in the training for the university management, academic staff and student leaders. The materials and course outlines were put together during a MESA training workshop in Nairobi (August 2009). The cartoon charts, which mainly highlighted unsustainable practices and the required and suggested changes, were developed later.

Though the use of modules in the training had been deemed a viable pedagogical approach, it was later established that the trainees had limited time for reading. This was mainly due to their commitments to their official workload. This meant that this pedagogical mode was not appropriate for the group and, therefore, we had to rely mainly on workshop trainings.

Phase 2: Training the university Management Committee, academic staff, and student leaders (August - September2009)

Training the Management Committee was done through a *dialogue* with the help of Dr Babikwa Daniel, the Environment Education Coordinator for the National Environment Management Authority (NEMA)[17]. Bringing in an ESD expert from outside the university was deemed a better approach in training seniors (addressing unequal power relations) and creating an environment for them to learn. The aim of training management is to influence attitude change, attract institutional support for the project, and reinforce sustainability consciousness in decision and policy making at management level.

We trained the academic staff ourselves through participatory workshops at the university. The three workshops were open to all staff and students. On top of the workshops, the targeted trainees were given reading material within the themes of the training. It was expected that after being trained the academic staff would be able to integrate ESD into their courses, research and practice and that they would be able to guide their students accordingly. Reflecting on sustainability in practice is particularly important in embedding ESD in a given subject area, since without such an exposure to students, tuition remains abstract and the student fails to grasp the full meaning of ESD (Dawe, Jucker& Martin, 2005). The changes that have so far ensued as a result of the training are indicated and examined in the achievements and challenges section below.

In training student leaders we also used a participatory approach to allow them to inform the process and thus actively participate in it.[18] They were trained on how to mobilise fellow students towards sustainability practices on campus. These are practices to do with proper waste disposal, environmental advocacy, resource use, and community service. It was expected that this training would enable student leaders to become exemplars and advocates for green practices on the campus. Such advocacy was projected to be

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[17] We used the word dialogue instead of training for strategic reasons. We did not want to give the Management Committee an impression that they did not know about sustainable development, that they had to be educated. Such an approach (with the assumption of ignorance) was anticipated to bring about resistance, which would not allow for the necessary change.
[18] Student leaders are elected by students to champion student causes and interests. They also act as a student liaison with the university management.

reflected in the work of student clubs and at individual level. Through this initiative, students were also expected to come up with their own sustainability initiatives for their halls of residence, compound, and the environment in general. In support of the student leaders, their training was preceded by a general student workshop to motivate all students towards ESD and related practices.

Phase 3: Developing a UMU ESD policy

We found it necessary to come up with a policy for the university to be used as a guide and benchmark for ESD in UMU. The process of drafting the policy is still ongoing and is to be informed by all stakeholders in UMU through a process that we are initiating by writing up a draft to be improved on. The draft will be sent to all staff and students to solicit commentsand insights on the basis of which improvements will be made. We will then work with all stakeholders, especially the Management Committee, to have the policy implemented in the university. Apart from obtaining valuable ideas, asking for input had the additional benefit of giving the stakeholders a sense of ownership of the process. We hope that this leads to the much needed support for the implementation of the policy.

Achievements and challenges

The achievements realised since the initiation of the project can be viewed from a number of perspectives. There are those that are a direct outcome of the project initiatives, some that can be partly attributed to the initiative, but which also drew on inspiration from elsewhere, and, lastly, those that may have been conceived outside of the project, but which reinforce the project goal.

There is reason to believe that the university management has started to take sustainability issues more seriously. To illustrate this trend, we shall cite a particularly promising, dramatic communication from the Deputy Vice Chancellor of Academic Affairs (Associate Professor Joseph Kisekka):

> I would like to inform you that four of our companions at the main campus withered, dried and eventually died. We shall not bury them! Instead they will be cut into pieces of timber for further use. The exercise is to take place on 13.10.2012. The Estates department has assured me that replanting will be effected on the same day. We thank the four for having fixed carbon dioxide, provided us with shade, beauty and any other benefit for all these years. The four should be proud of having fulfilled the purpose for which they were created (Email to staff, October 13, 2012).

We may not draw much in terms of commitment to ESD from the above communication, but it illustrates a promising spirit to be banked on in this project.

On student level, a club has already been formed by students under the name of *Professor WangariMaathai Sustainability Initiative.* It is still in the early stages of strategy development for the execution of its objectives, but has so far been very active in sending sustainability updates and information to staff and students through the university's intraweb. They have documented garbage disposal practices in and around the university, in partnership with the Rotaract Club at the University, and used the videos and graphics in workshops to advocate for better disposal practices. So far, their work has been received positively by staff, albeit on the student side the support seems to be coming quite slowly. This is understandable though, as it is not easy to change attitudes, especially with matters relating with lifestyle and convenience. The process will therefore have to take some time to realise attitudinal change and support.

It is also encouraging to note that a Green Campus Initiative has been started by some postgraduate students as an off-shoot of the Professor WangariMaathai Sustainability Initiative. They are mainly engaged in tree planting to green the campus and its surroundings. A nursery for fruit trees and other kinds of indigenous trees has been set up. Efforts are being made by the students and staff in the Department of Good Governance and Peace Studies to recruit and interest more people into the scheme. It is a commendable

trend that promises to yield sustainable fruits in future, but this shall only be the case if continuity across student generations is realised.

We drafted an ESD policy proposal intended to mainstream ESD in the institution in the three functions of the university namely teaching, research and community engagement. Operationally this would involve integrating environmental and sustainability concerns into all the disciplines, faculties, schools, institutes, programmes and courses of the university These concerns would also be integrated into the university policies, plans, management practices and in students activities. The policy was presented to the 119th meeting of Senate on 24th June, 2010, which has discussed it and passed it in principle. It was agreed that we take initiatives that would eventually culminate in putting in place a formal policy on mainstreaming ESD. The policy is yet to be officially signed.

Since that time, when one looks at some of the course outlines from the different faculties, there is an indication that integration of ESD elements in all course units is yet to be achieved. Although Deans were encouraged to monitor and follow up on the exercise, it is still proving a challenge to convince people from all sorts of disciplines to see the need for sustainability and integrate it in their teaching. Nevertheless, one good example of the best practices is the Faculty of the Built Environment. In their undergraduate courses, sustainability is integrated within the programme from first to final year of the programme. All teaching hinges on sustainability attained through interdisciplinarity. The faculty is also involved in partnerships with UN Habitat and several universities for research projects on energy efficiency and other elements of sustainable architecture.

In the Faculty of Agriculture, a Bachelor of Organic Agriculture and Master of Science in Agro-ecology have been initiated. The East African School of Diplomacy, Governance and International Studies also runs a Master of Arts in Sustainable Peace and Conflict Management. The faculty also hosts the Equator Peace Academy and participates in the Karamoja Cluster Project for the pacification of the border area between Kenya and Uganda.At the institutional level, the university has signed the Earth Charter and has accepted to host the Greater Masaka Regional Centre of Expertise on environmental issues, which is soon to be registered at the United Nations University in Tokyo.

Conclusion and Recommendations

The aim of this chapter was to explain and critically analyse the strategy for mainstreaming Education for Sustainable Development in Uganda Martyrs University. The analysis mainly covered the strategy stages, that is, the pre-implementation institutional audit, which involved stakeholder identification, setting of project objectives and roadmap, and the evaluation.

The analysis explored both the strengths and weaknesses of the strategy. In general, preliminary conclusions indicate that most of the objectives will be achieved. This is not to mean that the objectives will be met to the letter. Since the project is still ongoing we leave room for other hitherto unforeseen possibilities. Moreover, we indicated that some stakeholders, such as the faculty administrators and procurement officials, were not catered for in the strategy and that, for the trainings, modules did not work out well due to limited reading time on the side of the trainees.

On the basis of the analysis and the ensuing observations, we recommend the following for the improvement of UMU's ESD mainstreaming strategy:

i)   With due regard to the significance of inclusiveness in the success of EfS strategy, it will be worthwhile that we (the project coordinators) bring all stakeholders on board. This is mainly in reference to those who were left out, such as the faculty administrators, and procurement and estates officials. Leaving out some vital stakeholders may result into opposition and practices contrary to the mainstreaming process as sustainability values may not ring a bell among those not included in the training.

ii)   As part of the project, it would be a good idea for the university to introduce visits to universities and organisations with good practices to inspire her staff and students. Illustrating with concrete examples of success may be easier than trying to illustrate that change is possible through trainings and workshops.

iii)   More strategic partnerships will need to be forged to promote ESD in Uganda and East Africa.

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Chapter 8: Mainstreaming Environment And Sustainability In Tertiary Education: Some Experiences From MESA in Malawi

Marlene Chikuni, Gibson Mphepo and Sosten Chiotha

(University of Malawi, Malawi)

Abstract

Environmental sustainability is important in Malawi since more than half of the population is poor and relies on natural resources for livelihoods. Linked challenges of social, cultural, economic and environmental sustainability need to be addressed because people's livelihoods are threatened. Tertiary education through the University of Malawi (UNIMA) has a critical role to play in addressing these issues and in particular in developing graduates that are sustainably literate and ready to meet today's challenges as well as tomorrow's aspirations. This implies that all members of staff need to develop capabilities to lead not only curriculum and research change, but also to engage in outreach programmes. Mainstreaming of environment and sustainability in UNIMA is carried out through both formal and non-formal Environmental Education (EE). There have been efforts to build capacity that combines professional development of staff members with making curricula more responsive to current societal needs as a way of promoting a culture of sustainability. As a result, several faculties within UNIMA have undertaken curricula review which has resulted in revision of old syllabi and introduction of new courses that aim at addressing environmental challenges. There is promotion of inter-disciplinary learning, research, outreach and policy engagement through supporting new forms of learning (e.g. e-learning) that take into account the diversity of available opportunities. However, a lack of an environmental policy within the university has led to an *ad hoc* basis of incorporating EE in the curricula. Existence of such a policy would serve as a roadmap in achieving transformative leadership for sustainability in tertiary education. Overall, there is need for a change in mindset if the goal of mainstreaming environment and sustainability within tertiary education is to be realised in Malawi.

Introduction

Malawi is endowed with a rich base of natural resources, which is a source of livelihood for the 13 million inhabitants, more than 80% of which live in rural areas. The economy is agriculture-based and most farmers run small-scale farms and possess landholdings of less than a hectare on average. Malawi's national environmental action plan, NEAP, identified nine environmental problems related to sustainability, including soil erosion, deforestation, depletion of fish resources, water resource degradation, high population growth, threat to biological diversity, human habitat degradation, air pollution, and climate change (MOREA, 1994). These challenges impact the social, cultural, economic and environmental well being of its citizens. For example, in recent years Malawi has experienced droughts and floods, which have affected agricultural yields, thereby impacting food security negatively. Consequently, an anomaly in availability of natural resources threatens the livelihoods of more than 80% of Malawians, who live on less than one US dollar per day (UNICEF, 2013). This vulnerability of communities has necessitated interventions to mitigate the environmental threats, but also to introduce adaptation measures. Such interventions include imparting knowledge and skills through Environmental Education.

This chapter will describe some examples of how environment and sustainability are being mainstreamed in tertiary education through both formal and non-formal channels. It will also discuss the challenges that institutions face in efforts to achieve goals of education for sustainable development.

Environmental Education in Malawi

Education in Malawi can be formal, informal or non-formal. Traditionally, formal education is offered at primary, secondary and tertiary levels. The majority of students attend primary and secondary schools, whilst a small minority proceeds to college level. In response to various international and regional agreements, Malawi has put in measures to include Environmental Education in school curricula as one of the strategies to promote environmental stewardship and reverse environmental degradation. This is in line with goals as articulated in the second phase of the Malawi Growth and Development Strategy (MDGS II, 2011-2016), the objective of which is continued poverty reduction through sustainable economic growth and infrastructure development. Environmental Education plays a central role in environmental management as it helps individuals gain awareness of their environment and provides them with crucial knowledge, attitudes and skills to solve present and future environmental problems.

Climate change is one of the environmental challenges that the government is addressing through Environmental Education, since it is a cross-cutting issue affecting all sectors including health, water, energy, education, agriculture, forestry, and fisheries. These sectors in turn affect the social, economic and environmental aspects of people's livelihoods. Environmental Education and awareness take place at both informal and non-formal levels in Malawi through various ways, including awareness campaigns via print media, TV shows and radio programmes. Government has put in place strategies to promote Environmental Education, such as the National Environmental Education and Communication strategy as well as the National Strategy for Environmental Education (NSEE). The overall goal of the strategies is to cultivate an interest in learners participating in environmental problem identification and finding sustainable solutions. However, NSEE emphasis is on primary and secondary rather than tertiary education. Thus, efforts to mainstream environmental education at tertiary level have been on an ad-hoc basis.

Environmental Education at tertiary level: the case of the University of Malawi

Malawi has three public universities, namely Lilongwe University of Agriculture and Natural Resources (LUANAR), Mzuzu University (MZUNI) and University of Malawi (UNIMA). The latter comprises four constituent colleges: Chancellor College, the Polytechnic, College of Medicine and Kamuzu College of Nursing. University of Malawi is the oldest of the three public universities and has several faculties including science, education, engineering, nursing, medicine, commerce, built environment, law, and social science. This section will discuss efforts to mainstream Environmental Education within UNIMA, especially at Chancellor College, with respect to curriculum and research as well as greening of infrastructure. Chancellor College is a liberal arts college with five faculties (education, science, social science, humanities and law) and it is the largest of the constituent colleges of UNIMA.

Curriculum and research

Chancellor College departments offer Environmental Education as topics within undergraduate and postgraduate courses in faculties of science and education, but there is no stand alone course nor degree programme with tailor made courses for Education for Sustainable Development (ESD). For example, the Faculty of Science has a multidisciplinary and interdisciplinary masters programme in environmental science. Its topics were deliberately designed to cross physical sciences and include content from other faculties, e.g. Social Science, Humanities and Law (Chiotha, 2010). Since its inception, over seventy students have graduated and the popularity of the programme keeps growing. There are also courses in the Faculty of Education that address aspects of ESD. The

current environmental challenges have necessitated the need to offer course that are relevant and this has translated in periodic curricula review by departments. Thus, faculties at Chancellor College have also made efforts to 'green' their courses by revising strategic plans and proposing changes aimed at modifying old syllabi and introducing new courses to address environmental challenges. For example, the Faculty of Law has introduced a course titled Environment and Law, which addresses environmental issues from a legal perspective.

There are several research centres at Chancellor College, two of which are environmental in nature, namely the Natural Resources and Environmental Centre (NAREC) and Leadership for Environment and Development Southern and Eastern Africa (LEAD SEA). These centres are mandated to carry out research and mobilise resources for community engagement and advocacy. NAREC has coordinated and implemented projects in soil conservation, water resources, and agro-ecosystems, whist LEAD SEA has implemented projects in food security, water resources, biodiversity conservation, value added products, etcetera. Members of staff of these two research centres also participate in the teaching of some topics related to ESD within the Faculty of Science. Malawi hosted the Environmental Education Association of Southern Africa (EEASA) 31[st]conference in 2013, which was partly organised by the University of Malawi through Chancellor College and LEAD SEA.

Besides Chancellor College, there are other colleges within UNIMA that offer courses that address ESD related issues. For example, the Polytechnic offers environment related undergraduate courses through the Faculties of Applied Sciences and Built Environment. It also offers masters degrees in Environmental Protection and Management and Environmental Health. Polytechnic also houses a research centre, WASHTED, which focuses on capacity building in water supply, sanitation, health and appropriate technology development in Malawi.

Mainstreaming of environment and sustainability research at tertiary level has been undertaken at postgraduate level, and over the years a wide range of topics have been investigated. The major objective has been to address the key environmental challenges as outlined in government policies. Broad areas of research by postgraduate students related to environmental management have included:

- impacts of natural disasters and anthropogenic activities on the environment;
- biodiversity assessments, ecology and economic valuation of different flora and fauna;
- assessment of water quality and availability;
- use of indigenous knowledge in management of natural resources and adaptation to climate change;
- assessment of knowledge, skills and attitudes of students and communities in natural resources management; and
- renewable energy studies.

Some of the papers emanating from these studies have been published in peer reviewed international journals (e.g. Mlangeni & Chiotha, 2013).

Universities are supposed to carry out relevant research and the results of these studies need to be disseminated to the wider community. Deforestation is one of the key environmental challenges because biomass is the main source of energy for most Malawians. The rate of deforestation has been estimated to be in the range of 0.9-2.8% (PAI, 2009; FAO, 2010). Trees are cut down to expand areas for agriculture, burn bricks for housing construction, and provide firewood and charcoal, hence research has been geared towards identification of alternative sources of energy to replace firewood. One successful innovation to reduce deforestation has been the use of waste materials, such as paper, to make briquettes. Despite the campaign to reduce, reuse and recycle paper, Chancellor College still generates large amounts of waste paper and briquette making is one way of addressing the problem. The Lake Chilwa Basin Climate Change Adaptation Programme Technologies Learning Centre, set up through LEAD SEA, has been a learning avenue for school children and women from local communities on sustainability. The students learn the importance of recycling whilst the women find a new way of generating income whilst meeting their energy needs. These new skills can later be passed on to family and friends, which might translate into new behaviours in the long-term. Figure 1 below depicts a briquette making session attended by students.

Figure 1: Students from a primary school in Zomba being taught how to make

Briquettes at LCBCCAP Technologies Learning Centre

Greening infrastructure

The University of Malawi was established in 1965 and most of the buildings in all constituent colleges were constructed before the green campus concept was being promoted. A green campus implies efficient use of resources, such as buildings, space and equipment. There have been efforts to minimise waste and reduce costs of running institutions within the university as away of adapting to unfavourable economic conditions. For example, at Chancellor College, measures include the installation of solar geysers to cut on electricity bills (Figure 2), improved waste management facilities, water harvesting technologies and reserving of green places on campus for recreation. In cases where new buildings are being built, such as lecture theatres and student hostels, efforts are being made to construct environmentally friendly structures.

Figure 2: Solar geysers installed on student hostels at Chancellor College, Zomba

Green Campus Initiative (GCI)

The Green Campus Initiative was launched in 2009 at Chancellor College with the overall aim of promoting student participation in climate and environmental issues on campus and beyond. The initiative was promoted due to the realisation that the current youth will be the generation most impacted by climate change, and consequently must gain knowledge and acquire skills to protect their future. As a result, GCI members of Chancellor College have been involved in various awareness programmes, which have included Environmental Education outreach programmes, capacity building initiatives and other projects aimed at addressing the environmental degradation and the impact of climate change. One activity that Green Campus Initiative (GCI) members have been involved in around campus has been tree planting (Figure 3).

Figure 3: Members of GCI participating in tree planting

Non-formal Environmental Education by LEAD SEA

Non-formal education has been promoted as part of the National Education Sector Policy and Plan (NESP) to increase access to Environmental Education to complement the formal education sector (Government of Malawi, 2011). Leadership for Environment and Development, Southern and Eastern Africa (LEAD SEA) is one of the thirteen Member Programmes of LEAD International whose mission is to promote leadership and strengthen ecological and social resilience of ecosystems and communities to the impacts of natural and human induced shocks in Malawi and beyond. As already pointed out, LEAD SEA is a centre of excellence, which was established as a research and development centre at Chancellor College, University of Malawi to provide non-formal Environmental Education to various groups in Malawi and southern Africa. Since its establishment in 1994, LEAD SEA's core contribution to Education for Sustainable Development (ESD) has been training and capacity building in leadership for sustainable development, targeting a wide range of stakeholders. Apart from research activities, LEAD SEA is also the channel for MESA activities in the region.

Since January 2010, LEAD SEA has trained over a 1000 people in climate change mitigation and adaptation including community based organisations (e.g. village natural resources management committees, beach village committees, radio listening clubs, bird hunting clubs, water monitoring, and women fish trading groups), academia, faith groups, and policy makers. LEAD SEA has also made notable strides in reforestation by empowering communities with inputs for seedling production and facilitating their transplantation. Other initiatives include tree planting with Chancellor College staff and surrounding communities and the development of facilities for making fire briquettes as an alternative to charcoal.

LEAD SEA in partnership with Worldfish centre and Forestry Research Institute of Malawi has also established a community radio as an output of one of its projects on climate change adaptation within the Lake Chilwa basin. In Malawi, radio is probably one of the most effective communication channels considering that

36% of the population is illiterate, but 64 % of households own at least a radio (NSO, 2008). As a result, LEAD SEA has trained and established ten radio listening clubs which develop local radio programmes as a communication outlet to raise awareness on climate change causes, impacts, and mitigation and adaptation measures through the media. Members for these clubs are volunteer representatives chosen from within communities. To date, they have developed over fifty-five programme segments including *Let's Stop Hunger*; *Drying of Lake Chilwa*; and *Climate Change and Deforestation*, which are being broadcasted on the national MBC Radio 1.

Challenges associated with mainstreaming Environmental Education in Malawi

Mainstreaming Environmental Education in tertiary education

Despite Malawi's commitment to mainstreaming Environmental Education in the education sector at all levels, there is currently no university policy on how to mainstream Environmental Education in the various faculties. Hence, any efforts to offer environmental courses at both undergraduate and postgraduate levels by individual colleges are on ad hoc basis. An enabling policy environment is crucial for mobilising education and learning for sustainable development and scaling up of the ESD goals. Colleges are not obliged to teach Environmental Education and those that do so, do not have stand alone modules, but rather cover topics within courses. It has been reported that the presence of an environmental management plan is one of the indicators to demonstrate mainstreaming efforts of environmental issues at tertiary level. However, if a management plan is to succeed, it must be mainstreamed into the university's operations rather than being side-lined as a soft management issue (Carpenter& Meehan, 2002). The University of Malawi does not have an environmental policy in place and the lack of which is a challenge because there is no mechanism to monitor and evaluate compliance with environmental standards.

However, the individual constituent colleges have engaged in activities that relate to environmental management, which are implemented in accordance with the Environmental Management Act (EMA).These activities include paper recycling, afforestation programmes, waste management, and alternative technologies. For example, Chancellor College has engaged students, staff, and smallholder farmers from surrounding villages in the rehabilitation of the Chirunga Forest. These groups of people have also been engaged in the recycling of paper and other waste through the establishment and operation of a technologies learning centre. The learning centre teaches surrounding communities climate smart agriculture and alternative and efficient energy technologies, including the production of briquettes and biogas from waste materials.

Additionally, public universities face both human and economic challenges in mainstreaming environmental sustainability through curricula, research and outreach programmes. Due to inadequate funding from government, universities fail to achieve some activities that would promote environmental management. This also translates in reduced numbers of members of staff due to so-called *brain drain,* because people migrate to better paying jobs within the country and beyond. A general assessment of the masters in environmental science programme indicates that even though all students manage to grasp theoretical concepts of ESD and pass course work, a few fail to complete their research component, partly due to poor supervisor-student interaction. Limited funding also results in research projects that lack innovation to address local challenges. The lack of funding is compounded by poor linkages with the private sector and this weakness is being addressed through public private partnerships in terms of joint research proposals to address common interests.

Mainstreaming Environmental Education in non formal education

Challenges related to mainstreaming Environmental Education in non-formal education by LEAD SEA has been in relation to language, especially the accurate translation of technical terms and concepts like *climate change* and *green-house effect* into local languages. These words do not have a direct equivalent in the

vocabulary of Chichewa (the local dialect), hence closely related phrases were used. For example, climate change became *kusintha kwanyengo*, which means *times have changed* and this led to use of a customised toolkit as part of training materials. This toolkit used non-technical language and illustrations to depict communities in Malawi and their experiences of impacts from climate change.

Conclusion

Environmental management is very important for Malawi because livelihoods are heavily dependent on natural resources. In light of environmental challenges, especially climate change, Environmental Education is indispensable in changing people's mindset towards stewardship of the environment. Formal and non-formal Environmental Education is vital in instilling environmental and ethical awareness by training people in coping strategies to meet environmental challenges. This is one way of empowering communities in assessing and addressing their sustainable development concerns. Teaching, research and community engagement in addressing sustainability issues are key priorities of constituent colleges of UNIMA. In the past, environmental challenges, such as climate change, have been addressed through formal education curriculum with slow progress mainly due to lack of a policy that would serve as a roadmap for ESD activities within UNIMA. Lately, curriculum review in some colleges, e.g. Chancellor College has incorporated modules that address challenges related to environment management so that sustainability is implemented in curricula. However, there is need for consolidation of courses so that duplication is minimised. MESA Malawi, through LEAD SEA, has made significant progress in mainstreaming environment and sustainability through non-formal education via various outreach programmes. Thus, implementation of MESA activities within Chancellor College has been multidisciplinary through both curricula and research centres. Student activities have also complemented efforts of MESA Malawi through the green campus initiative.

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Chapter 9: Mainstreaming Education For Sustainable Development In Teacher Education At Busitema University, Uganda

Edward Andama and Ujeyo M. S. Suubi

(Buisitema University, Uganda)

Abstract

This chapter examines the implementation of a Change Project aimed at mainstreaming ESD principles and practices in teacher education in Faculty of Science and Education, Busitema University. The long-term desired outcome of the project was to equip teachers with the knowledge and skills needed to initiate and promote sustainability practices and to prepare them to become educators of sustainability. Under the ITP-ESD project a compulsory ESD course, infusing the contents of ESD courses into the professional disciplinary courses, practical activities, research, and community engagement activities were implemented. A student green campus initiative has resulted in the formation of two student-based associations, which became modules for involving student and staff community in wider community engagement activities. Strong linkages were established with the key stakeholders, such as the neighbouring town council, district local governments, and surrounding schools to initiate joint ESD activities within communities. There was also a need for awareness campaigns targeting the staff and student community as well as the wider stakeholder community by organising weekly public lectures and presentations, writing in popular press, and interviews. Key community outreach activities included visits to schools on career guidance, sanitation sensitisation in the urban community, and undertaking joint research and community engagement activities with other tertiary institutions and Non-Government Organisations (NGOs), among others. These collaborative activities within the community and key stakeholders have expanded the outreach and the impacts of the Change Project. This chapter provides background to the Change Project by exploring the environment at national, institutional and faculty level. It explains the significance of the project and provides the project focus and rationale. This chapter further stresses the critical importance of working with key stakeholders and describes the outcomes and challenges encountered. It concludes with continuity issues and recommendations that stem from the lessons learnt.

Background

Busitema University is the first institution in Uganda that has successfully implemented a Change Project on "Mainstreaming Education for Sustainable Development (ESD) in Teacher Education training programme". The Change Project is in line with Uganda's commitment to educate for sustainable development, as reflected in the Education for Sustainable Development Uganda implementation strategy (UNATCOM, 2010). The Uganda ESD strategy outlines ESD values reflecting on environmental, social and economic sustainability. It recognises universities as key players or change agents in instilling and propagating positive attitudes, promoting public awareness and understanding of ESD, streamlining ESD in existing education systems through curricula reviews and training, and retraining human resources for implementing ESD, among others. This strategy provides a framework for different stakeholders in all sectors to take individual and collective

actions within their means and context to contribute towards achieving sustainable development of the country, as set out in the vision 2040 that laid out a road map for socio-economic transformation of the Ugandan community from peasant to a modern and prosperous society within the next thirty years (MFPED, 2014).

At an institutional level, Busitema University (n.d.) has committed from the start to educate for sustainability, which is reflected in the university's mission "To provide high standard training, engage in quality research and outreach for socio-economic transformation and sustainable development" (unpaged). Busitema University's first strategic plan 2009-2013 emphasised sustainability as a core theme in implementation of the plan. This provided the impetus and the opportunity to initiate formal ESD activities in the university, which began with the pilot project of streamlining ESD in teacher education at the Faculty of Science and Education. The project was evaluated at faculty level and is expected to be scaled up within the university's academic and other programmes. This will be further expanded to other higher institutions of learning in Eastern Uganda and the rest of the country. Documenting the achievements, challenges and proposing a way forward will provide a framework to expand the initiative to other disciplines.

The project's objectives included the mainstreaming of ESD principles and practices into all teacher education training programmes in the university; the sensitising of students, staff, civil society organisations, local governments, private sector and the community regarding ESD; and promoting of staff and student based outreach activities within the neighbouring community, including career guidance, working with the local town council on waste management, sanitation, and tree planting among other identified activities and innovations.

Significance of the Change Project

The education system in Uganda has been criticised for failing to produce graduates with practical, appropriate, and relevant skills, values, positive attitudes, and work ethics, who can survive and promote sustainable management of resources in a challenging and dynamic world. This triggered the need to review curricula at all levels in order to change the outcome. Due to their profession of guiding in knowledge delivery, teachers are very influential and critical in modelling the future of the society they serve. They act as role models for the learners and as such have the opportunity to empower them with knowledge, skills and strategies of imparting sustainability, which can have far reaching long-term impacts on the future of the society. Therefore, the opportunity to develop a Change Project focusing on teacher education seemed very appropriate.

The context of the Change Project

McKeown (2002) underscores the importance of training leaders for sustainability. Organisations and communities are encouraged to train people who will guide societal plans for sustainability. Relevant education is one that trains people to critically reflect and gain knowledge and skills that should help them address social, economic and environmental problems. The Busitema University Change Project contributes towards the international ITP – ESD programme goal of seeking to (i) deepen understanding of the environmental, social-cultural and economic dynamics of sustainable development, and (ii) enhance the teaching, learning, research, community involvement and management of higher education institutions with regard to ESD. The ITP -ESD course techniques and methodologies provided avenues for reflection. The Education for Sustainable Development framework aims to promote a sense of justice, responsibility, exploration, and dialogue that will lead to positive change in behaviour, necessary for promoting activities and lifestyles leading to sustainable development (UNATCOM, 2010). The goal of the Uganda ESD implementation strategy was to promote education as the foundation of a more sustainable society whilst integrating elements of sustainable development into the education system at all levels. This requires revisiting all aspects of education and development, including curricula, pedagogy, philosophy, goals and aspirations. We strongly believe that a well-trained teacher with multiple skills in ESD can contribute towards community transformation through educative processes. As the ESD toolkit suggests, we intend to empower

the students with skills, perspectives, values and knowledge so that they can go out into society with ESD expertise.

The topics included in the cross-cutting ESD course in the Faculty of Science and Education provide linkages between environment, society and economy. The topics are derived from the National ESD strategy, which focuses on the key issues of poverty, economic development, transformation, governance, democracy, natural resources management and utilisation, energy, waste management, globalisation/localisation, culture, patriotism, ethnicity, health (including HIV/AIDS), ethical conduct, and values. These are key issues the country is still grappling with on a daily basis. The topics are woven together in such a way that environment becomes the bigger picture. They are linked to the national priority areas identified in the national ESD implementations strategy.

Framework for mainstreaming ESD in the curriculum

The education system in Uganda has been criticised for failing to produce graduates with practical, appropriate and relevant skills, values, attitudes, and work ethics to promote sustainability in a challenging and dynamic world. Implementation of ESD in the higher education system in Uganda is facing great obstacles. For example, analysis of Busitema University programmes indicates that there was a low level of integration of sustainability in many of the university's core activities of teaching, research and community outreach programmes. Shi (2006) outlines four curriculum frameworks that could be effective approaches for ESD in universities and these are (i) developing compulsory courses or limited selective courses emphasizing intended knowledge areas of focus (ii) developing courses related to ESD according to the discipline (iii) infusing the contents of ESD courses into the professional disciplinary   courses and (iv) practical activities and research such as field trips focusing on ESD, or green communities activities in universities, which provide a great chance for student participation. At Faculty of Science and Education all of the four curriculum frameworks approaches were adopted, with particular emphasis on compulsory ESD course, practical activities, research and community engagement activities. We adopted a practical interactive approach so as to encourage dialogue and debate, and to initiate processes of critical thinking regarding sustainability issues. The cross-cutting course was developed for all faculty level programmes with the intention of eventually rolling this to the entire university programmes. The course uses a participatory approach, departing from an entirely traditional lecture method by blending it with practical skills and role-playing activities. In addition to the theoretical background provided by lectures, documentaries, public talks, field trips and research, students participate in community engagement activities and green campus initiatives. The students have to write reports about their involvement in ESD activities on campus or in the community outreach projects as part of the assessment. This approach is expected to produce graduates with skills, attitude, behaviour and knowledge to solve real societal problems.

Stakeholder involvement in the project

Stakeholder involvement was important for the success of the project. The project was developed using a participatory approach in which key actors and stakeholders contributed and were involved in workshops (Figure 1). The team engaged the top administration of the university, as well as the faculty staff and students. Two regional workshops were organised to sensitise the key stakeholders.

Figure 1: Cross-section of stakeholder participants in the institutional seminar on ESD, organised by Busitema University on 27th March 2012 at Rock Hotel in Tororo Municipality Uganda.

Facilitators of curriculum development and review were drawn from different groups of people, including lecturers from different universities, local government officials, environmentalists, and non-governmental organisations, among others. This widened the knowledge base and provided a wide range of expertise to develop a comprehensive and widely acceptable ESD compliant curriculum. Moreover, the Faculty of Science and Education was set for a curricula review, thus providing a very strategic and timely opportunity to streamline ESD in the teacher education programme.

Busitema University hosts the Greater Eastern Uganda Regional Centre of Expertise (GEURCE). Being part of the Regional Centre of Expertise (RCE) community, the activities of GEURCE complimented project activities by learning from the RCE collaborations and networks at regional, national and global scales. The multi-campus nature of the university (Figure 2) makes it easier to operate and undertake activities related to ESD in various parts of eastern Uganda. As a result, the complimenting advantages of a multi-campus approach create public awareness on ESD within the wider community. This benefited the Change Project through interactions with communities from other institutions and organisations that share a common goal.
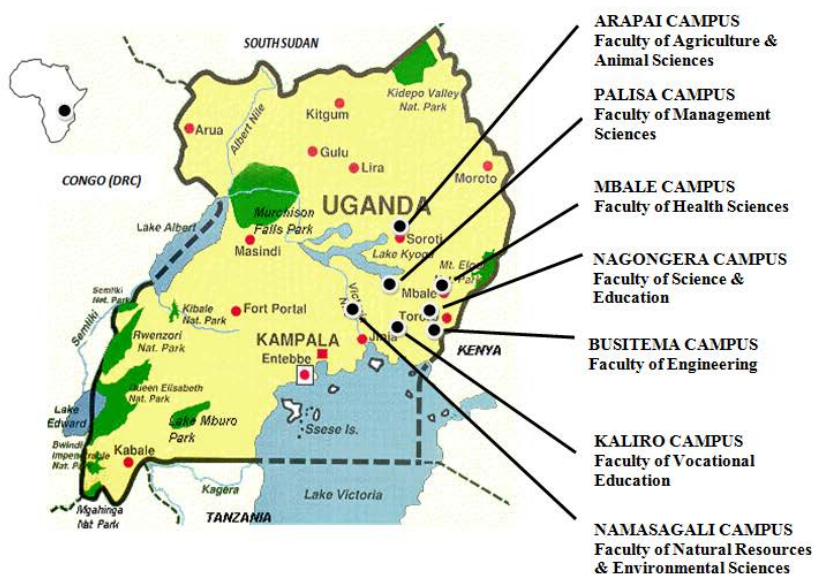

Figure 2. Distribution of Busitema University campuses under the multi-campus set up within Eastern Uganda

The outcomes of the Change Project

A key outcome of the Change Project was the development of a cross-cutting course, which will benefit all students in various programmes in the Faculty of Science and Education. The course named ESD is already being delivered to the Bachelor of Science Education (BSE) and Diploma in Education Primary (DEP) students. The Master in Educational Leadership and Management (MELM) students are also set to benefit by taking the course unit. Local training was also organised to guide the course leaders in the different programmes. This aimed to enhance their skills and knowledge in delivering the course and ensure that there was uniformity in quality and that relevant contextualised teaching and learning materials and activities were developed. The department teaching staff was trained in pedagogical transformations as reflected in the participatory and reflexive orientations of the courses in each subject during the review of old programmes and the development of new ones. ESD has also been infused into other new disciplines at undergraduate and postgraduate level programmes, such as geography, agriculture, economics, and entrepreneurship education. With the reviewed curriculum for both the BSE and DEP already under implementation, at the end of the first cycle of the curriculum the faculty expects to produce teachers who have knowledge and skills to educate for sustainability and influence their learners and community to adopt sustainable practices.

As part of sensitisation and capacity development on ESD, presentations continue to be made during faculty based weekly public seminars to the campus community. Sensitisation sessions with staff and student community proved very helpful in raising awareness among the campus community. The campus community is more informed about living sustainably. The community is working towards environmental sustainability and is keen to participate in activities that encourage sustainability. So far, two student-based groups have been formed to spearhead campus sustainability activities and community engagement. These are the Education for Sustainable Development Association and the Nature Uganda Association. These student groups, with the support of the staff, are already deeply involved in community outreach activities, which are appreciated by the community at large. These activities include mentorship and career guidance session targeting both primary and secondary school children (Figure 3). Downstream analysis of the project outcomes showed a very positive impact on both faculty students involved and the secondary school students, as they started taking spontaneous individual and/or group actions, such as forming wildlife associations and promoting tree growing, among others (Figure 4). This project is thus a good example of collaboration between secondary/primary and higher education levels to promote ESD practices and initiatives.

Figure 3. Bachelor of Science Education student giving mentorship and career guidance to a group of secondary school students of Petta Community Secondary School in Tororo District Uganda, during March 2013 community outreach activity

Figure 4. University students and secondary school students participating in tree planting exercise at Namwaya Community Martyrs' College in Tororo Uganda

Due to the intense sensitisation activities, the faculty staff members are now more informed about ESD. Multiple sustainability activities and projects have also been started on campus and various initiatives are now scaled up to have a broader reach. For example, trees have been planted on the campus as a step towards environmental conservation. Our ESD student group is already carrying out collaborative sustainability projects in the schools and community around the university to encourage the community to take responsibility about the environment and to be aware about their ways of living.

Key to the community engagement was the initiation of tree planting and the cleaning of the areas in the nearby town council (Figure 5). Establishing collaboration with NGOs and institutions that seek to promote ESD resulted in the launch of the Nature Uganda branch in Busitema University (Figure 6). The launch was made possible because of the involvement of students in ESD. In general we would say we are making seemingly slow but sure progress towards responsible behaviour for sustainability. Presently a number of the university staff actively participating in outreach activities with students has increased significantly. We have built long-term partnerships with the local community, secondary schools and the town council near the campus in tree planting drives, sanitation drives among other activities. We have also developed community-based off-campus teacher education projects within the local community   schools to improve the delivery of schooling to underprivileged schools within the community.

Figure 5. A team of staff and students participate in the cleaning at the nearby town council (Nagongera Campus)

Figure 6. Group of Nature Uganda Executives and participants during the launch of Nature Uganda branch at Nagongera campus Busitema University

The involvement of Deans of other faculties of Busitema University and representatives of other universities and tertiary institutions in the region during the sensitisation seminars provided the opportunity to scale up the initiative. The participants were very enthusiastic about adopting ESD in their training, management and outreach programmes. The university has now accepted to incorporate ESD in all graduate programmes as a cross-cutting course unit. Continued collaboration with the greater Eastern Regional Centre of Expertise (RCE) is resulting in continued sensitisation programmes, while lobbying for local government and private sector support and involvement is gaining momentum. We developed links between the faculty and other tertiary institutions, such as colleges of commerce, nursing/midwifery, teacher training colleges, research institutions and the local government based on the promotion and implementation of ESD ideal. The private sector and civil society organisations are fully involved and are supportive to collaborate in the ESD activities. During the implementation of the project activities, team members participated in raising the awareness levels of ESD by writing articles in popular daily press, giving media interviews, lectures, and presentations at conferences and workshops within the country.

Challenges and constraints

It would be unrealistic to say that the project was met with success only. Firstly, the initial perception of ESD by staff and student was that it was Environmental Education, therefore convincing them to participate was a challenge in the beginning. Secondly, the approach to ESD being multi- and trans-disciplinary, requires people who are skilled and comfortable in teaching across disciplines. Such people are very limited in the faculty because the training background of most of the staff is discipline based. Thus, there is a need to build their competences further than the borders of their own field of specialisation, and to build appreciation of the complex nature of sustainable development. Thirdly, we anticipated that the reviewed curriculum for the faculty would have been approved by the beginning of the 2012/2013 academic year, but this did not happen. The process of programme approval from senate up to the National Council of Higher Education (NCHE) took a very long time and the approved new curriculum was allowed to run from 2013/2014 academic year. Fourthly, there are many courses in the curricular for both the BSE and DEP, making timetabling challenging and thus giving the students a high course load, which limits the time for student involvement in practical and participatory activities on campus or even with the wider community. Additionally, there are activities we had planned to do at university level, which have so far not been possible. For example, we planned to ensure that the university develops an ESD policy and that we take the ESD drive to other faculties and campuses of the university, but these have not been done yet. Lastly, there are financial and material resource limitations. Human resources for the curriculum implementation are meant to be drawn from different sectors, some of them from outside the faculty or university, and this makes it a very expensive venture. Additionally,

documentaries need to be purchased or hired and student community engagements or outreaches all require facilitation in terms of finance and transport.

Conclusion

Delivering quality education that will lead to the development of ideologies, practices, and promoting of sustainable living to best serve humanity in the future can effectively be undertaken through appropriate teacher education. Streamlining ESD in all teacher training programmes provides the first entry point towards achieving this. At the heart of the Change Project at Busitema University was the reorientation of teacher education at the degree and diploma levels. Despite the outlined challenges, the Change Project has already yielded fruit and all we need is to ensure continuity and strengthening its implementation. We need to carry out more sensitisation in order to get more people involved. We need to keep opening up a dialogue and strengthen linkages with other stakeholders.

Recommendations

In order to adopt ESD on country wide level, it is important for the Ministry of Education to prevail over the educational institutions to ensure that their entire curricula are reoriented to address sustainability by giving students the skills, perspectives, values, and knowledge to live sustainable in their communities. For higher education institutions, the accreditation body in Uganda, the National Council for Higher Education (NCHE), can provide accreditation guidelines, which incorporate ESD as one of the issues streamlined in all university and tertiary institutions teaching programmes. This will necessitate setting up subject specialist for ESD within the NCHE system. It is also necessary to engage teacher unions and national certification board (NCHE) in the conceptual development and implementation of ESD. The ESD programmes and activities need to be implemented within an institutional policy framework. Lack of national, provincial, local and institutional policy to support ESD is a constraint. Thus developing a university wide policy on ESD is commendable. There is need to build robust research to improve information and guide ESD implementation. This requires dedicated funds to undertake ESD related research activities. There is also need to engage the National Curriculum Development Centre (NCD), teachers and the Ministry of Education and Sports to revise teacher education and certification requirements to include ESD and to align revisions to correspond to the ESD components of elementary and secondary education. Moreover, there is a need to create professional development programmes on ESD for teacher educators in the country.

Acknowledgements

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Chapter 10: Mainstreaming Education For Sustainable Development In A Nigerian University: A Grass-Root And Pragmatic Approach

Ayobami T. Salami, Babafemi Odunsi and Simisola Odeyinka

(Obafemi Awolowo University, Nigeria)

Abstract

In the undertaking of social and economic activities, information and knowledge on sustainable development are crucial if the earth, as common heritage of humans, is to be preserved for the present and generations ahead. It is against this background, that this chapter engages with the mainstreaming of Education for Sustainable Development with the Obafemi Awolowo University, Ile-Ife, Nigeria, as a case study. The essence is to examine our approach to the process of integrating a sub-regional sustainable development education drive with the university action as pivot. The chapter discusses the theoretical and practical measures taken to effectively impact sustainable development education in the area of study. It analyses the challenges faced and how some of the challenges have been confronted. With an evaluation of the gains made so far, the chapter projects into the future of sustainable development education in higher institutions in Nigeria and across the Central / West African sub-region. In summation, the chapter posits that a pragmatic approach touching the grass-roots, particularly in the context of stakeholders, is essential for an effective drive to mainstream sustainable development.

Introduction

At different points humans started appreciating the need to deal more sympathetically with the environment so that the living conditions of man in the present and future would not be jeopardised. This propelled discourses and debates on the conservation of natural resources, cleaner environment and pollution control measures (Okorodudu-Fubara, 1998). As the issue of environmental degradation transcends national boundaries, the search for solutions brought concerted international projects, which spawned a plethora of treaties, such as the *Rio Declaration on Environment and Development* (1992), *Vienna Convention for the Protection of the Ozone Layer* (1988) and the current focus on *sustainable development*.

Among other measures, universities have been involved in the global efforts to ensure sustainable development. Based on their traditional role of imparting knowledge, the principal intervention of universities has been to develop and disseminate knowledge on sustainable development. The expectation is that such knowledge would propel *appropriate behaviour* that would benefit the environment and humans too.

Obafemi Awolowo University in Nigeria is one of the African universities involved in the project of entrenching or mainstreaming education to ensure sustainable development. This chapter examines how the university's *OAU MESA Group* has integrated sustainability education in its community in Nigeria and in the Central and West African region through some proactive measures. The paper identifies the gains made by the group and the challenges encountered. Set against the background of a recent troubling sociopolitical development in Nigeria, the paper re-emphasises the crucial need to pragmatically address widespread poverty in Nigeria and other developing countries, so that the global aspiration for sustainable development is not be hindered.

Mainstreaming Education for Sustainable Development

Information and knowledge on sustainable development are crucial if the earth, as the common heritage of humans and other living things, is to be preserved for the present and future generations. It is in this context that the project of mainstreaming Education for Sustainable Development, especially at higher education level, is of great importance. In underscoring this importance the United Nations (UN), declared the years 2005–2014 as the United Nations Decade of Education for Sustainable Development (UNDESD).

Generally, the UNDESD aims to integrate sustainability knowledge and practices into education. The expectation is that the measure would encourage behavioural changes and thereby create a more sustainable future in terms of environmental sanctity, economic viability, and a just society for present and future generations (UNESCO, 2005). According to UNESCO, the process for achieving the integration encompasses:

> Rethinking and revising education from nursery school to university to include a clear focus of current and future societies on the development of knowledge, skills, perspectives and values related to sustainability. This means reviews of existing curricula in terms of its objectives and content to develop transdisciplinary understandings of social, economic and environmental sustainability and recommended and mandated approaches to teaching, learning and assessment. (UNESCO, 2006, p.56)

Universities as change agents for sustainable development

Flowing from their traditional missions of teaching, research, and community services, universities are recognised to take up a very important role in the drive for sustainable development (UNEP, 2006). Universities have the duty to dispense education with values that will produce students who can play a role in seeking solutions to societal problems and preserving the earth for the present and future generations. Apart from being an avenue for imparting sustainable development mentalities in students, universities stand as potent avenues for capacity building - a key component in the successful implementation of sustainable development, especially on climate change policies in developing countries (UN University, 2007).

In Africa, hundreds of universities train and graduate thousands of students yearly. If armed with the requisite knowledge coupled with commitment to sustainable development, this population group, presently and in future, constitute a formidable pool of change agents who can bring about the desired changes in their respective societies. It is on this platform of hope that UNEP sets the Mainstreaming Environment and Sustainability in African Universities (MESA) partnership for the injection of the principles and values of sustainable development into higher education on the continent.

That Africa needs interventions, such as MESA, is hardly debatable in the light of the benumbing environmental, developmental and related challenges confronting the continent, especially the sub-Saharan region. Largely, the story of Africa is a chronicle of long exploitation of nature and people. The exploitation, along with inappropriate policies, corruption, bad governance, poor management practices and limited choices, have contributed to the numerous environmental and related problems plaguing Africa (UNEP, 2006).

It is trite that sustainability problems confronting developing countries of Africa are different from those confronting the developed countries. Presumably, African universities are better positioned to engage peculiar African environmental, developmental and related challenges in the context of local African structures. In devising an African approach, instead of a global approach, through the partnership with African universities, the MESA partnership is a good input in the pursuit of the spirit of sustainable development on the African continent.

Obafemi Awolowo University and ESD in Central and West Africa

Obafefemi Awolowo University (OAU) is one of the African universities involved in the UNEP MESA partnership. OAU is owned and funded by the Nigerian federal government and located in the historical ancient city of Ile-Ife, Osun State. The university was founded in 1962 as the University of Ife by the regional government of Western Nigeria, but was renamed Obafemi Awolowo University in 1987, in memory of the late Chief Obafemi Awolowo, first premier of the former Western Region of Nigeria, whose brainchild the university was (OAU, n.d.). The university has an enrolment of more than 20,000 undergraduate and about 10,000 graduate students, and offers academic programmes in diverse fields spanning humanities, arts, natural sciences, social sciences, medical sciences, engineering and technology. The academic programmes are run across thirteen faculties and two colleges encompassing about seventy departments. Apart from its conventional faculties and colleges, the university has institutes and centres funded by federal and international agencies. These include the Institute of Agricultural Research and Training, Institute of Ecology and Environmental Studies, Institute of Cultural Studies, African Institute for Science Policy and Innovation (AISPI), Institute for Entrepreneurship Education and Development Studies (IFEDS), the ECA Regional Centre for Training in Aerospace Survey (RECTAS), the African Regional Centre for Space Science and Technology Education-English (ARCSSTE-E), and the Centre for Energy Research and Development (CERD).

The official involvement of OAU in the MESA Partnership started in 2007, with its nomination as the ESD coordinating institution for the Central / West African region. Subsequently, a number of the university's academic and non-academic staff in diverse professional areas undertook capacity-building training in Sweden. Following this, in July 2007, another ESD capacity-building training was held in Nigeria. A larger number of university staff as well as delegates from the Nigerian government agencies took part in the training. Also taking part were academics and professionals from other Central and West African countries, such as Cameroon, The Gambia, Liberia and Senegal. After the training, the participating staff of Obafemi Awolowo University formed the Obafemi Awolowo University MESA Group. The OAU MESA group became the launching pad for the MESA project in the university and beyond.

The OAU MESA Group

The OAU MESA Group aims to implant ESD principles into various aspects of the existing university curriculum. The university has some environment-related courses taught at undergraduate and postgraduate levels in the Faculties of Science, Law, Technology, Environmental Design and Management and the Institute of Ecology and Environmental Studies. These courses include Environmental Law; Energy, Oil and Gas Law; Man and Nature; Environmental Impact Assessment; Human Settlement and Development; and Climate Change. Most of the handlers of these courses are members of the OAU MESA Group and notable advocates of ESD. Prominent among these is Professor Margaret Okorodudu-Fubara, a foremost Environmental Law scholar in Nigeria who has had extensive engagements with various national and international institutions, including UNEP.

However, the OAU MESA Group noted that mainstreaming ESD through the existing conventional courses has a limited effect, as only students participating in these courses, which are mostly optional, are afforded the opportunity of ESD. To address this limitation and to give all students access to ESD knowledge, the group has been holding general class sessions, involving all students in the university through the university's Faculty Colloquium mechanism. The university has a policy of organising Faculty Colloquium periodically. The colloquium entails a convergence of all students in each faculty interacting with lecturers and university officials. Presentations and lectures are normally given on diverse topics at the forum. With the cooperation of the university management, OAU MESA Group has inducted ESD lectures into these sessions with about two hours devoted to discussions, questions and answers on ESD issues at each session.

Additionally, the group is working on getting a specific course on ESD into the university curriculum, which is intended to be available to all students at undergraduate level. The course is proposed to be situated in the Faculty of Science and will start running once the proposal goes through the curriculum development and approval procedures of the university.

Another proactive approach adopted by the OAU MESA Group is working with and through student organisations within the university. The university has vibrant student organisations, which engage in diverse projects and activities. For the promotion of ESD ideals, the OAU MESA Group maintained close contact with organisations that have projects and activities touching on environmental and related issues. For example, student organisations have organised public lectures and debates on environment and sustainability development issues. There was a consequent emergence of organisations focusing on sustainability issues, with names such as *Green Acre.* The OAU MESA Group supports such efforts by, for example, appointing a member as Staff Advisor for these organisations. The efforts have notched a noticeable measure of success in the spread of awareness among students and created another pool of ESD advocates.

The OAU MESA Group also adopted a consultative and interactive approach to spread the tenets of sustainability beyond the university community by means of *informal ESD*. This entails creating awareness amongst influential leaders in different communities about sustainability ideals. The hope is that their powerful voices in support of sustainable development will have a good impact in their respective communities. For example, during the capacity building training in Iloko-Ijesha, Nigeria, the king of the town, the late Oba Oladele Olashore, hosted all the participants to a dinner in his palace. During this occasion, we gave a presentation on the aims and ideals of ESD to the highly influential monarch. At different times too, the OAU MESA Group has engaged in enlightenment campaigns targeted at the local people who engage in commercial and other activities within the university campus and the adjoining communities.

Additionally, the OAU MESA Group has taken some practical measures to propagate and mainstream ESD at national and regional levels. The pivotal measure is the legal incorporation of an organisation, named Central / West Africa Network for Sustainable Development Education and Environment (CWANSDEE), as a *Body Corporate of Incorporated Trustees* under the Nigerian *Companies and Allied Matters Act* in 2012. The main goal of the CWANSDEE, as set out in its constitution and related documents, is to propagate and mainstream ESD in Nigeria and across Central / West Africa. The principal objectives are to (i) achieve mainstreaming of environment and sustainability issues in West / Central Africa in higher institutions with a view of enhancing the relevance and contribution of higher education to the people of the region and their environment; (ii) enhance the orientation of environmental education and sustainable development in higher institutions of learning; and (iii) work with relevant national, regional and international agencies and institutions to foster and increase quality of teaching and learning in Education for Sustainable Development in West and Central Africa. The CWANSDEE is a non-governmental organisation (NGO), providing the OAU MESA Group with a legal platform through which to pursue MESD without the bureaucratic hindrances and protocols of the university system, even though it still works within and for the purpose and benefit of the university. The Liberian arm of CWANSDEE was inaugurated in March 2014, with the support of the Association of Liberian Universities (ALU).

By and large, the drive to mainstream the principles and values of ESD has made reasonable progress in Obafemi Awolowo University, although not as much as desired. It is inspiring to recall that the term *sustainable development* has become a sort of brand name and clarion call in the university community. More inspiring is that the OAU MESA Group has erected a sustainable structure for the further strengthening of ESD in the university and beyond. However, the MESD odyssey in the university so far has not necessarily been a testimony of smooth sail. There have been the typical challenges that confront new ideas and innovations, especially those that confront long established and seemingly acceptable ways of behaviour. Some of the challenges that stand in the way of MESD in the OAU are considered in the following section.

Stomach infrastructure and other challenges

In the task to mainstream ESD, the OAU MESA Group came up against resistance, cynicism, indifference, un-receptiveness and latent hostility from different quarters. Moreover, complex and cumbersome university rules and procedures relating to curricular development and related issues have hindered the emergence of a specific course on ESD. At different points there have been issues of motivation fatigue on the parts of protagonists of ESD, due to diverse factors, especially a sense of *is it worth the trouble?,* when results do not seem to match the inputs and efforts. Luckily, such occurrences were addressed by creative trouble-shooting and revival strategies by the group's leadership to keep the MESD cruise from capsizing.

The essence of MESD is not to simply integrate ESD, but that these integration efforts ultimately have a positive impact on the environment through behavioural change. This is the angle in which the issue of poverty as a catalyst of unwholesome human dealing with the environment comes into focus as a potent challenge to ESD. The concern is how and whether mere impartation of sustainability education would necessarily translate in healthy dealing with the environment or sustainable development. The reality, as the OAU MESA Group has observed from interactions, is that in situations where people daily struggle to meet basic needs, the issue of sustainable development in any form may be of secondary importance to them, if important at all. The depth of this mentality can be illustrated with the recent resonance of the concept of *stomach infrastructure* in Nigeria, following a regional election in one of the states (Onasanya, 2014). In the election, the electorate voted out the incumbent governor, despite a quite impressive record of infrastructural and related developments that stand to bring about long-term economic and other benefits to the state (Jamiu, 2013). Reportedly, the reason for voting out the governor was that many people were going hungry in the state due to poverty and the governor failed to address infrastructure for the people's stomachs (Adindu, 2014). The mentality of the electorate is likely to be understood by many people in Nigeria and developing countries experiencing high levels of poverty. Two proverbs among the Yoruba, one of the dominant tribes in Nigeria, would even seem to sanctify the position of the hungry and angry electorate. The first proverb is *ebi o ki nwonu, ki oro miran wo ibe*, which can be translated as *a person affected by hunger cannot accommodate any other issue* or *nothing else matters to a hungry person*. A related proverb is, *ti ebi ba ti kuro ninu ishe, ishe bu'se!*, meaning *once a poverty-stricken person has food to eat, the poverty has ended*. Thus, it is not surprising that measures of rice and kerosene are becoming entrenched in political election campaigns in some parts of Nigeria (Makinde, 2014).

Overall, the issue of poverty and *stomach infrastructure* in Nigeria presents a sobering and ominous perspective for the MESD project as a whole: what practical impact would ESD have in situations where people face hunger and other manifestations of poverty? Unfortunately, stomach infrastructure seems the most likely choice for people choosing between embracing societal sustainability infrastructure or their individual stomach infrastructure. It is remarkable that the World Summit on Sustainable Development (WSSD), held in Johannesburg in 2000, recognised the connection between poverty and unsustainable patterns of production and consumption.

Conclusion

Obafemi Awolowo University and some other African universities have engaged with the MESA partnership to assist in the propagation of sustainable development knowledge across the African continent. Every African university inducted into this partnership has a sacred duty to live up to expectations in taking sagacious and pragmatic measures to achieve success in the ESD project. It is against this background that the OAU MESA Group evolved as the pivot of MESD in Obafemi Awolowo University. The group has engaged with the task of MESD through different proactive measures. The measures include transmitting ESD to students of the university at different fora and undertaking ESD propagation projects with student and non-student organisations within and outside the university. There have also been efforts to create a specific ESD course for all undergraduate students in the university. Furthermore, aiming to disseminate the tenets of ESD beyond

the university community at national and international levels, the OAU MESA Group has incorporated a legal body known as CWANSDEE. Generally, despite some inherent challenges, the drive to mainstream ESD has made notable progress in Obafemi Awolowo University. The OAU MESA Group has erected a robust structure through which it can vibrantly undertake and sustain the noble project of entrenching ESD in Obafemi Awolowo University and beyond in the present and in future.

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Chapter 11: Towards Education For Sustainable Development (ESD) Implementation In The Faculty Of Science Of The Alexandria University

Boshra Salem and Ahmed Rashed
(Alexandria University, Egypt)

Abstract

The objective of this paper is to demonstrate the importance of mainstreaming Education for Sustainable Development in higher education, and describe the Change Project that was implemented in the Department of Environmental Sciences in the Faculty of Science of the University of Alexandria. The study involved implementing ESD programmes that are locally relevant and culturally appropriate. This was achieved by developing a complementary educational kit associated with an *Ecosystems* compulsory course, which is an important and basic course for the undergraduate students, and *Remote Sensing and GIS* course, which is an important multidisciplinary course. The kit produced was used as a tool to reorient existing curriculum to address sustainable development. Its benefit proved twofold. Firstly, it helped postgraduate students, who carry out the practical sessions to undergraduate students, to be trained to introduce ESD and at the same time enhance an understanding of the linkages among the issues of sustainable development. Secondly, it helped the undergraduates to develop necessary knowledge, skills, new perspectives and values. Evaluation of the process resulted in 82% satisfaction of the students. It is therefore recommended to encourage the implementation of ESD in further subjects of the curriculum of the Alexandria University.

Introduction

Egypt faces big challenges in the fields of environment, agriculture, biodiversity, water and energy. It is therefore important to direct the attention of the students to the links between these fields and related issues in Egypt, as well as to a future focus on modern biotechnology and its importance to cope with major challenges that they will face in the future. The January 25 Revolution has caused a substantial transformation of Egyptians' consciousness. Universities are a good example of how the previous regime worked to subvert the independence of Egyptian institutions. This regime used its power to appoint university presidents who would inevitably be loyal to the old regime in order to ensure that universities could not be mobilised as centres of resistance to this regime. These crony university presidents would then appoint cronies as deans of the various faculties. This has affected the education level in Egypt, and this was reflected in the national development of the country. There is substantial anecdotal evidence showing that a real democratic transformation is taking place throughout Egyptian society. This transformation that also takes place within the educational system, will allow the concept of sustainable development to spread quicker and the trend of Education for Sustainable Development (ESD) to be infused within every level of the education system.

The Faculty of Science of the University of Alexandria consists of nine departments, the youngest of which is the Department of Environmental Sciences. The main aim of the department is to offer a quality educational system in environmental studies through which students become highly capable of dealing rationally with contemporary environmental issues. Moreover, the department provides sound and effective solutions

necessary for protecting the environment through advanced and non-traditional educational and scientific research programmes. These programmes are based on multidisciplinary approaches providing necessary basic knowledge and applied skills. Although the courses of the Department of Environmental Sciences are based on multi- and interdisciplinary approaches, crossing over ecological, social, economic and legislative aspects, the concept of ESD was not considered as an approach for teaching. Therefore, there was a good opportunity to formulate a Change Project and implement it into the *Ecosystems* compulsory course, which is an important and basic course for undergraduate students, and the *Remote Sensing and GIS* course, which is an important multidisciplinary undergraduate course. The project has been a very good opportunity to fine-tune the teaching methodologies towards sustainable development.

The key stakeholders of the Change Project are the undergraduate and postgraduate students of the Department of Environmental Sciences in the Faculty of Science of the University of Alexandria. The project focused on building the capacity of students to learn skills that will help them manage and interact with the local environment. Such locally relevant skills will be developed by hands-on activities on the subject of interest. As a result of engaging in particular activities and achieving certain objectives, students will gain skills. Such skills would generally be generic in nature and could be applied by the student in other areas and contexts outside of the actual classroom / activity in which they are developed. Examples of the skills students develop are communication skills, scientific skills, teamwork skills, critical thinking skills, analytical skills, creativity skills, discussion skills, empathy skills, self-evaluation skills, reflection skills, higher order thinking skills, mathematical skills, evaluation skills, and research skills. Appendix 1 contains an example of an activity linking geography, as demonstrated by Remote Sensing and GIS, Oceanography and Biological Socioeconomic Sciences.

Implementation process of the Change Project

The implementation process aimed at integrating ESD into the Department of Environmental Sciences. It was achieved through the following steps:
1. organising awareness workshops to explain the concept of ESD;
2. mapping the major compulsory courses of the undergraduate studies;
3. selecting the courses for implementation of ESD concepts;
4. developing complementary educational kits for selected courses;
5. training of MSc students, who are teaching undergraduates on ESD;
6. mapping and assessing the MSc core courses using the USAT tool; and
7. developing recommendations on where changes could be made to reorient towards ESD in postgraduate courses.

Methodology

Several workshops were held to introduce the idea of ESD to the staff members and the Department of Environmental Sciences. In order to make the educational kits relevant to the curriculum, it was important to analyse the current curriculum of the undergraduates' and postgraduates' major compulsory courses by mapping them. The curriculum mapping (CM) also helped in identifying the links between educational units and assessing the strengths and weaknesses in the curriculum. The process was performed by listing all the courses in a matrix, and identifying the number of links each particular course has with other courses, as exemplified below. A high number of links indicates a multidisciplinary approach and appropriateness for ESD. As a result, such courses were selected for ESD implementation. These multidisciplinary courses enable students to have a wider view of scientific concepts and applications, based upon the students' specific educational and career interests. Students may pursue these programmes at the associates, bachelors and masters degree levels. Students can focus on their preferred discipline while exploring other interests and

acquiring complementary knowledge and skills. Such courses provide a good medium for implementing ESD and harmonising sociopolitical and economic goals with technologies and systems that are focussed on minimising environmental impacts and enhancing welfare.

The next step in the process was to use a tool to measure how and to what extent environment and sustainability initiatives were integrated into a wide range of different faculties, departments, and administrative and research units. There are several sustainability assessment tools, e.g. ULSF's (2009) Sustainability Assessment Questionnaire (SAQ), Roorda's (2001) Auditing Instrument for Sustainability in Higher Education (AISHE), and Lozano's (2006) Graphical Assessment for Sustainability in Higher Education (GASU). The tool we used in our Change Project is the Unit Based Sustainability Tool (USAT), which integrates features form all the above (Togo & Lotz-Sisitka, 2009). The USAT tool was used to assess how sustainability concerns are integrated into the core functions of teaching, research, community engagement and management operations in the curricula of the postgraduate studies at the Department of Environmental Science.

The USAT tool is divided into four parts for ease of administration (Figure 1). Since the tool was used on a departmental level, only parts A and C were assessed in this project, as described in the following section on the results of the institutional audit.
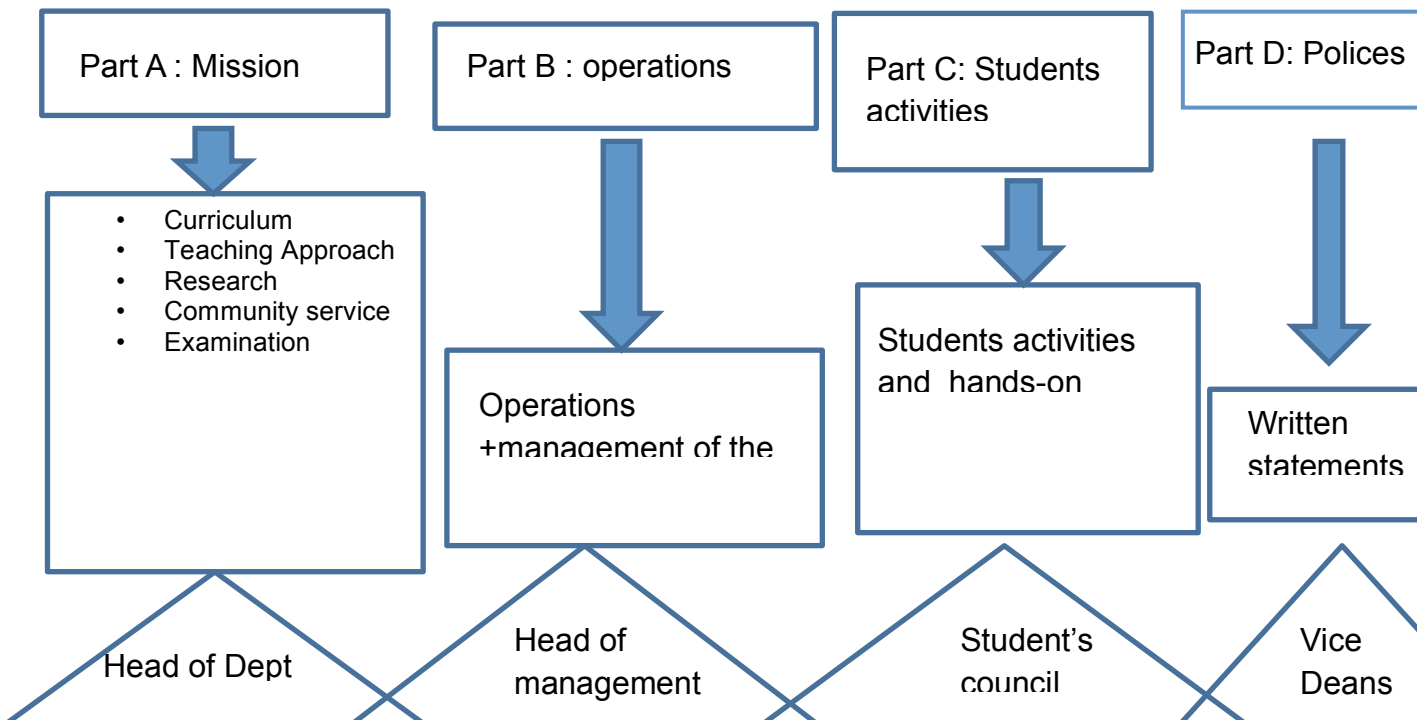
Figure 1: Representation of the four parts of the USAT tool

Results and discussion of the USAT audit

A matrix was developed to list the compulsory courses of the major Environmental Sciences. The number of links for each subject was counted to denote that this particular subject could be a candidate course for integrating ESD and developing complementary kits for this course. Links mean that the content of any particular course attains links to other courses. For instance, the content of the course ENV 101 *Introduction to Environmental sciences* gives a general background on environmental studies and paves the way for all other courses to be taught till graduation. This course content is essential and complementary to all courses

particularly the courses ENV 203 *Ecosystems*, ENV 301 *Remote Sensing* and ENV 402 *Contemporary environmental issues.* All these courses include environmental, socioeconomic and cultural aspects.

The final results are indicated in Table 1, which shows the total number of links for each subject. The highlighted subjects are the ones that make good candidates for the implementation of ESD.

Table 1: Total number of links for each subject

No	Course name	No. of links
101	Introduction to Environmental Sciences	19
102	Practical principles	5
201	Earth sciences and energy sources	8
202	Environmental biology	8
203	Ecosystems	17
204	Environmental hydrology	12
205	Marine sciences	11
301	Remote sensing	11
302	Geographic information systems	12
303	Environmental microbiology	12
304	Conservation of natural resources	13
305	Desert and desertification	14
306	Environmental chemistry	9
308	Environmental chemistry (Practical)	8
401	Environmental pollution	14
402	Contemporary Environmental Issues	18
403	Environmental pollution (Practical)	12
404	Series of general lectures	15
405	Environmental impact assessments	14
407	Environmental management legislations	13
490	Research project	-

As shown in Table 1, the courses *Introduction to environmental sciences*, *Ecosystems*, and *Contemporary environmental issues* proof good candidates to demonstrate ESD concepts to the undergraduate students, and to develop complementary kits for and train postgraduate students to use such kits in classrooms. The two courses *Remote Sensing and GIS* together also show many links to other courses, so the practical lessons that combine both subjects were also used to demonstrate ESD concepts.

Mapping the core courses of MSc programme of the Department of Environmental Sciences involved the same process as described above. The core course mapping is illustrated in Table 2.

Table 2: Mapping and links between the core courses of MSc courses

No	Course name	1	2	3	4	5	6	7	No. of links
1	Biotechnology	-	x	✓	x	x	x	✓	2
2	Biodiversity		-	✓	✓	✓	x	✓	4
3	Environmental pollution			-	x	✓	✓	✓	5
4	Conservation and management of natural				-	x	x	✓	2

	resources								
5	Quaternary era and climate change					-	x	x	2
6	Integrated waste management						-	✓	2
7	Environmental data analysis							-	5

Table 2 shows that three out of seven courses are linked, which demonstrates the multidisciplinary approach of the MSc courses. In the current Change Project there are no educational kits devoted to the MSc courses; however, we do make the recommendation to improve the MSc core courses for the sake of better interlinkages and multidisciplinarily. Besides, the MSc students will be trained on ESD concepts and implementation through their teaching responsibilities to the undergraduates.

Figure 2 is a graphic representation of the curriculum assessment of the MSc courses in the Environmental Sciences Department. Figure 2(a) indicates that the entire curriculum, as one unit, is considered to have integrated sustainability concerns into its core functions of teaching, research, community engagement and management operations. The following Figures 2(b) through 2(g) represent each subject of the curriculum separately. These figures reflect the same ideas highlighted above, but with more emphasis on the integration of sustainability issues in each of the specific MSc core courses.

(a)

(b)

(c)

(d)
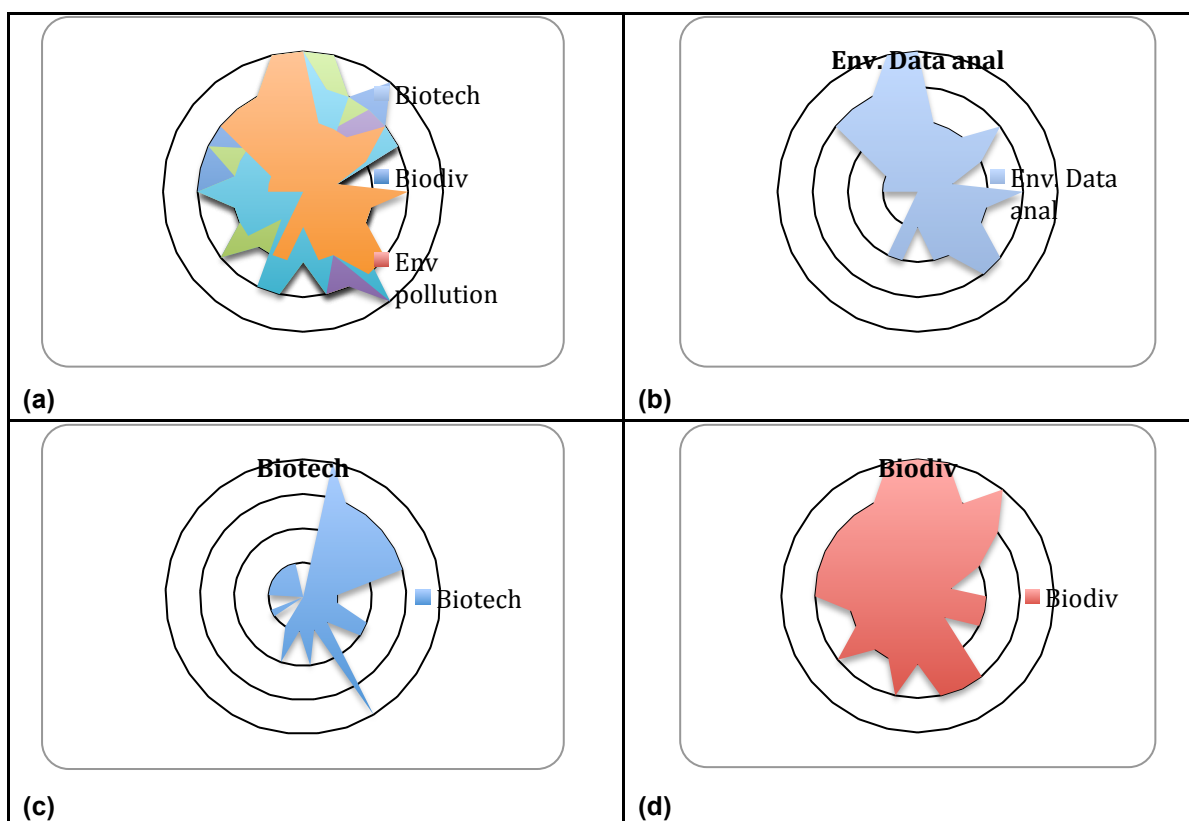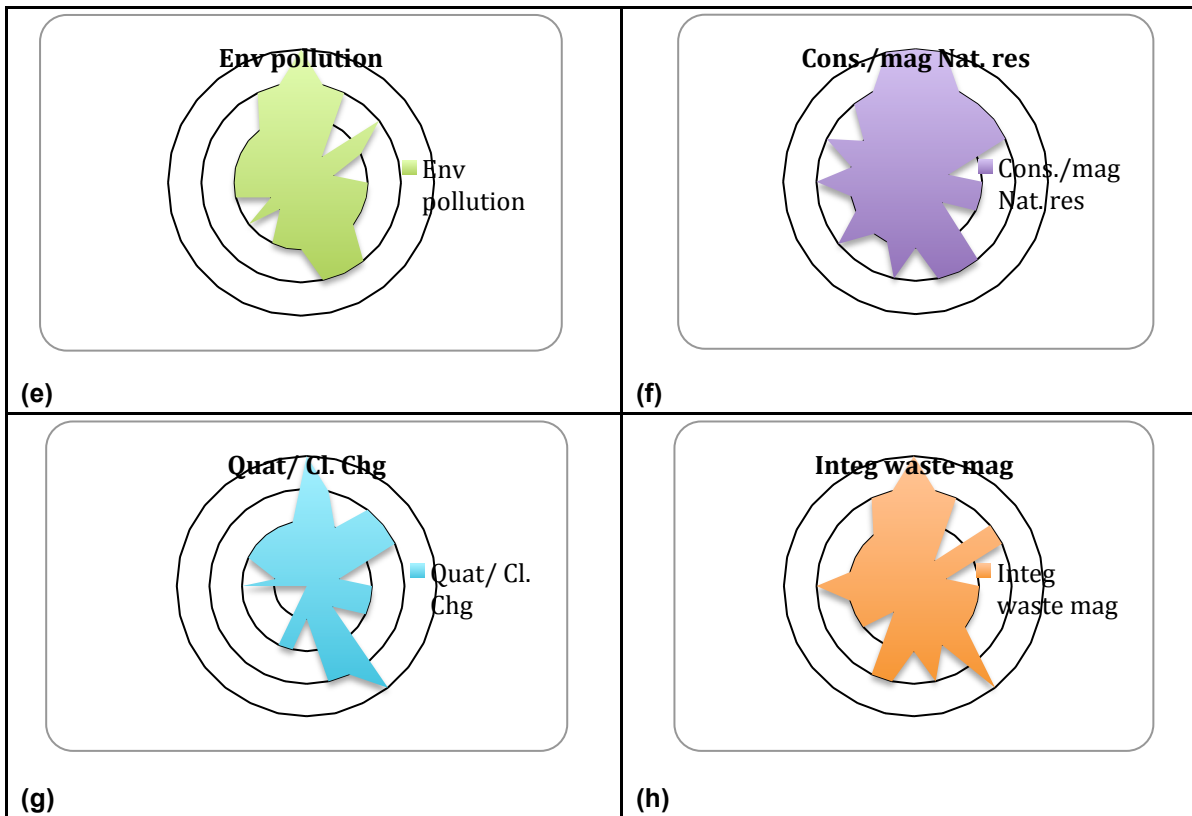
Figure 2: Curriculum assessment of the MSc courses in the Environmental Sciences Department

The indicators in the USAT Part C include assessment of student involvement in voluntary activities related to sustainability, such as student orientation programmes and career counselling, student politics and governance for sustainability, and collaboration of students and management on sustainability issues. Interviews with students were conducted to gain more information on this aspect. The graphical representation in Figure 3 shows the results of this assessment.
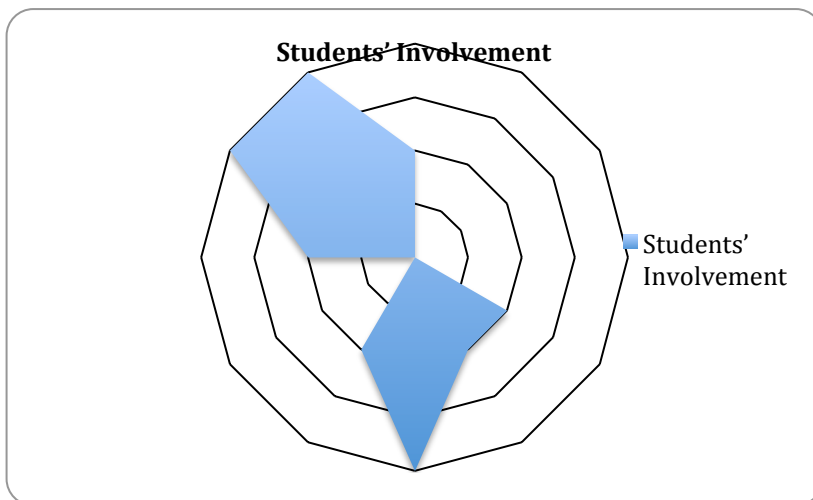
Figure 3: Student involvement assessment of the Environmental Sciences Department

Out of the twelve criteria of student involvement, only seven were considered to be relevant to the Department of Environmental Sciences. Figure 3 shows that of these seven the following attained high scores:
- SW12: Students' willingness to take responsibility in the environmental and sustainability area.
- ES11: Environmental and sustainability activities initiated by students themselves.

- VS7: Voluntary community service by students related to sustainability issues and concerns.

These criteria were followed by:
- SM10: Student collaboration with management in the area of environmental sustainability.
- S18: Involvement of student groups across campus in sustainability initiatives.
- SA6: Student environmental and sustainability awareness programmes.
- OP5: Orientation programme(s) on sustainability for students.

Considering these results, the following can be concluded:

1. By mapping the curriculum of the undergraduates of the Department of Environmental Sciences it was shown that the curriculum is multidisciplinary in nature, which makes it compatible with ESD concepts. However, this requires ESD kits need to be developed for these courses to complement the curriculum. These kits can be implemented by students during the practical and tutorial sessions.

2. By mapping the postgraduate core courses, it was found that these were also built on the basis of multidisciplinarity. This trend gives the postgraduate students the opportunity to be trained on ESD concepts and apply the kits when teaching classes to the undergraduates.

3. The USAT audit of the postgraduate curriculum provides useful insights into the sustainability profile of the department and into the differences and similarities in the ways in which sustainable development is interpreted and practiced in the department. It brought out various relationships between sustainability practices. For example, between courses of the curriculum within the department, and between management and operational units and student activities. We also identified where these relationship were lacking.

4. Although not all courses in the curriculum of the postgraduate programme have ESD content, together they reflect the concept and are considered to have integrated sustainability concerns into their core functions of teaching, research, community engagement and management operations.

5. Student involvement is considered to be good in terms of the students' willingness to take responsibility in the environmental and sustainability area; the environmental and sustainability activities initiated by students themselves; and the voluntary community service related to sustainability issues and concerns. However, more effort needs to be directed to student involvement in different assessments of the curriculum, and in the monitoring and follow-up of alumni.

Development and evaluation of educational kit

ESD educational kits were developed to infuse the concept of ESD into the curriculum without changing its content. These kits are complementary to the curriculum in provide an active way for students to be involved in the teaching and learning process. The kit contains activities that the students can implement to develop their intellectual and scientific skills. These activities have already been applied in a pilot and proved to be very interesting to the students. Further evaluation was conducted at the end of the academic term to assess the successfulness of the implementation of the kit. The several linkages between courses were the main consideration in preparing the kits. This meant that one activity could be applied to convey a message in biology, and the same activity could be adapted to fulfil the needs of another subject, for example, chemistry. During the development of the kits the Intended Learning Outcomes (ILOs) for the kit was one of the points considered to highlight the importance of implementation of the kit, with emphasis on linkages between subjects. Other considerations for the development of the kit were the number of students in a class; the number of students involved in group work; the internet speed available to students; the cost of the kit material; the time slot required for each activity and how this time allocation could fit into the course schedule;

the allocation of marks for each activity as part of the total mark for a course; and the need to prepare evaluation exams that comply with the kind of activity implemented.

Activities were tabled in a matrix to highlight which topics in the core course correspond to which activity in the kit. This matrix serves as a guide to find the particular activity for each course item. Activities were compiled in a draft manual and revised in terms of structure after new activities were added and a template for each activity was introduced, as shown in Table 3. Two appendices were developed to provide students with more information about the topics addressed. Assessment methodologies and toolkit evaluation tools were developed for the final toolkit.

Table 3: Activity Template

Activity number	
Title of Activity	
Location of Activity	
Duration	
Learning Objectives	
Necessary Materials	
Information sources (if any)	

The ESD kit is comprised of the following:

1. a scope of the course, including an introduction and a description of the topics addressed;
2. an introduction to ESD and definition of transdisciplinarity, multidisciplinarity and interdisciplinarity;
3. the types of knowledge addressed and included values;
4. skills and competences objectives;
5. an activities matrix;
6. an activities manual;
7. a Transformative Learning and curriculum innovation evaluation; and
8. the appendices (glossary of terms and additional information).

In order to ensure that the kit is successfully applied, disseminated and sustained, the following actions were undertaken:

1. approval from the department committee was sought for implementation;
2. the ESD kit was implemented for undergraduates and student evaluation;
3. postgraduate student were trained;.
4. an outreach workshop was organised; and
5. knowledge was spread to other relevant departments in faculty through seminars and general presentations.

Conclusion

Our Change Project is concerned with the revisioning and reorientation of education towards sustainability concepts. The project drew the attention of students in the Department of Environmental Sciences to the importance of sustainability development. The connection between various courses has been highlighted and demonstrated to students. The activities produced in the kits have been implemented and proved to be successful in delivering the sustainable development message.

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APPENDIX 1: Activity example

Title of activity	Estuaries : Interface between sea and land
Location of activity	Class room
Subjects	Science: Ecology, Biology, Oceanography Social: Geography - Remote Sensing and GIS Economic: Wetland Valuation
Duration	2 class periods (total 4 hours)
Learning objectives	The student will: 1. Describe the types of estuaries and their functions 2. Identify where estuaries lie in Egypt 3. Explain the value of estuaries in maintaining the integrity of natural ecosystems 4. State the impact of human use and misuse has on estuaries

Necessary materials	Satellite imagery of different dates (soft copies or hard copies)
	Computer and image processing software
	Maps
	Tracing papers
	Coloured pens
	Calculators
Information sources (if any)	Estuaries The Handbook of Environmental Chemistry Volume 5H, 2006, pp. 149-173: http://link.springer.com/chapter/10.1007%2F698_5_025. **The Nile Estuary: by Waleed Hamza**

Background information

The River Nile is the dominant geographic feature of northeast Africa and the longest river on Earth. At the point where the Nile discharges into the Mediterranean, the great Nile delta was formed and furnished the most fertile area for cultivation in the Egyptian territory. The delta is embraced by two large branches of the Nile (the Rosetta and Damietta branches) and their promontories. Both branches discharge freshwater directly and indirectly into the Mediterranean Sea to form the Nile estuary. Some of the most dynamic areas on Earth are found at the interface of land and sea, especially in areas we know as estuaries. Estuaries are areas of unusual activity and have a production comparable to our most productive agricultural lands. There are three good definitions of an estuary: (1) "a semi-enclosed coastal body of water, which has a free connection with the open sea, and within which seawater is measurably diluted with freshwater from land drainage" (Pritchard, 1967, p. 3); (2) "deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partially obstructed, or sporadic access to the ocean and in which ocean water is at least occasionally diluted by freshwater runoff from land" (Randolph, 2004, p. 539); and (3) "a marine ecosystem where freshwater enters the ocean" (Wyman & Harold Stevenson, 2007, p. 151).

Some important functions of estuaries are: (1) providing nursery areas for commercial seafood populations; (2) providing shelter for many small marine animals; (3) acting as a storm buffer to prevent floods and absorb energy from storms; and (4) detoxifying wastes. They also provide suitable habitat for millions of birds, both local and migratory.

Human impact is the greatest stress on estuaries. They are subject to sudden changes due to development, filling, dredging, discharging, and dumping to accommodate human needs. Two-thirds of the human population lives on one third of the land near the coast! Of course, this is where the estuaries are located! Humans redirect the enormous forces of nature and often think nothing will happen. People have only recently begun to appreciate the values and functions of estuaries in the natural world. Small activities have large unforeseen consequences. By-products of human activity, such as industrial wastes, heat, solid wastes, agricultural runoff (e.g. silt, herbicides, pesticides, organic matter), and private citizen wastes (e.g. septic tanks, inadequate oil and chemical disposal, litter), all adversely impact upon estuaries. Some pesticides are retained in the body and build up in the progression of the food chain (biological magnification). Levees eliminate precious sediment. Dams cut off fresh water. Runoff from pavement and roofs causes erosion and carries pollutants to the estuaries, killing animals and plants. Overfishing can lead to extinction and destroys the fishing industry.

- Find out what the impact is of the Aswan Dam on Egyptian estuaries.

The physical environment of an estuary includes intertidal emergent wetlands, seagrass meadows, soft bottoms, hard substrates, and aerial habitat. The biotic component includes animals-mollusks, arthropods, reptiles, fish, birds, mammals, an extensive interstitial community, and plants, *Juncus, Salicornia*, shrubs,

phytoplankton, benthic plants, and bacteria. The mud in an estuary can be eight feet thick and is, for the most part, anaerobic and very rich in nutrients. The pulse of the tides, creating a daily or twice daily flushing, brings renewal and diversity of temperature, salinity, and DO (dissolved oxygen).

- Find out about the diversity of species in estuaries.

Limiting factors, such as elevation, tides, temperature, salinity, desiccation, and predation, mean that animals must be adaptable to live in the estuarine environment. Nowhere is the food web more apparent and fragile than in the estuary.

Advanced preparation
- Have students locate the estuaries on wall maps, or satellite images of different dates and mark each one with one colour. Discuss estuaries that students may have visited or seen.
- Discuss how so many estuaries have been damaged or destroyed. Talk about values, natural stresses, and human impact. Try to find solutions for misuse and destruction of estuaries.
- Let the students find the differences in areas of estuaries using computers (in case of soft copy satellite imagery), or trace the boundaries using trace papers and coloured pens if using hard copy maps or satellite imagery.
- Let the students trace the path of the river that drains into the sea.
- Research the major sources of pollution in each major city along the chosen river.
- Research and describe how a long river carries pollution all the way down its path to the Delta.

Assignment
a.   Have students write a one-page summary about estuaries, their function, and human impact on them.
b.   Students should be able to describe the estuary type, discuss the benefits of an estuary, and discuss destruction and remediation.
c.   Test term knowledge by taking a vocabulary quiz.

Extensions
a.   Discuss food webs in estuaries.
b.   Discuss possible results of estuary destruction.
c.   Field visit to an estuary.

PART C: Green Campus Initiatives

Chapter 12: Nelson Mandela Metropolitan University George Campus Student Mobilisation Change Project

Bianca Currie

(Nelson Mandela Metropolitan University, South Africa)

Abstract

This chapter shares the experiences of the Nelson Mandela Metropolitan University (NMMU) Student Mobilisation Change Project, which was completed as part of the Swedish International Development Agency (SIDA) International Training Programme (ITP) within the wider Mainstreaming Environment and Sustainability in Africa (MESA) programme. The project focused on establishing a formalised body for student action and as a platform to the student voice for sustainability on the NMMU George Campus.

From the initial baseline assessment of Education for Sustainable Development (ESD) at NMMU George Campus a significant lack of student involvement in sustainability issues on the campus was evident. As shown in the chapter, according to the final assessment of student involvement on the campus at the end of the Change Project, a great improvement is observed and all the initial stumbling blocks associated with establishing the Green Campus Forum (GCF) as a formalised body were overcome. The necessary management structures were put in place to ensure the sustainable management of the entity. Since the start of the project, student membership and actions for sustainable development on the campus and the surrounding areas have greatly increased. Reflecting on the Change Project a few years later, shows that this initial investment in establishing a strong foundation for the student action project has been sustainable, and green campus activities continue to be driven by student participation and involvement.

Description of the context of the project

The initiative reported on in this paper, initially developed as a Change Project in 2011/12 within the Swedish International Development Cooperation Agency (SIDA) and supported by an Advanced International Training Programme (ITP) on Education for Sustainable Development (ESD) in Higher Education. Its relevance can be seen in relation to regional goals, such as those put forward by the Southern African Development Community, who agreed to support the Decade of Education for Sustainable Development initiative where several themes were identified highlighting specific needs (Lotz-Sisitka, Olvitt, Gumede & Pesanayi, 2006). In supporting ESD practices a need to strengthen leadership to be more able to respond to socio ecological challenges by paying more attention to ESD approaches in universities was noted (*ibid*).

NMMU, based in the Eastern Cape of South Africa, has a vision to make a significant contribution to sustainability in the southern Cape and beyond, through excellent teaching and learning, research and community engagement. It has multiple campuses, and the NMMU George Campus (where this case study was based) has a strong focus on promoting sustainability through the physical design of the campus and through academic activities and community engagement. Several policies and practices have been put in place in order to reduce the consumption of natural resources on the campus. A Sustainability Research Unit was launched in 2010 to develop the capacity for sustainable management of ecological, social and economic systems through user inspired research, training, community engagement and policy contributions.

The NMMU George Campus efforts are certainly small wins worth celebrating but one area in which the campus was not succeeding is in mobilizing the student body. Little buy-in for the sustainability projects and programmes on the campus were initially forthcoming and the establishment of a GCF by faculty staff in 2010 did not attract the attention or necessary commitment from students on the Campus. The lack of student participation was highlighted as a threat in the George Campus Strategic Plan of 2010 and therefore became the initial focus for the NMMU change project as part of the ITP ESD in Higher Education, which was developed in 2011/12.

To make any change in terms of student mobilization on the NMMU George Campus, key individuals within the institution were engaged with and became stakeholders in the project. Initially, discussions with the campus principal and key students occurred.

Baseline assessment

The first step in the NMMU change project involved determining a baseline position of ESD on the NMMU George Campus. The baseline assessment involved applying a Unit-based Sustainability Assessment Tool (USAT) (Togo & Lotz-Sisitka, 2009) and conducting a survey on student knowledge, understanding and attitudes to sustainability practices and projects on the campus. The results derived from both the USAT and survey highlighted the areas of deficiency with regards to education for sustainable development and helped to guide the focus of the NMMU George Campus change project.

Use of the unit-based sustainability assessment tool
The Unit-based Sustainability Assessment Tool (USAT) (Togo & Lotz-Sisitka, 2009) was used as a framework for assessment. An overall assessment of all the core functions on the NMMU George Campus was initially performed to give the overall picture of ESD on the campus. The summative results of which are displayed in Figure 1. This bigger picture firstly highlighted that the original choice focus for the NMMU change project was correct because not only has student involvement been highlighted as a threat in the 2010 strategic plan for the campus but it was also reflected as the worst performing area in the overall USAT assessment.

Furthermore, weak areas in each of the functional sections were also highlighted. The weaknesses identified under the teaching, research and community service included the lack of cross faculty collaboration programmes, the degree to which global sustainability issues and challenges form part of department research is low, the level of commitment of department resources in sustainability projects in the community was also shown to be low, examination or assessment of sustainability topics was lacking and the willingness of staff to research and undertake service activities on sustainability topics was weak (2011 assessment, see Figure 1).

Figure 1 shows that the operations management function category showed great success, even though there were weaknesses in improving indoor air quality, lack of an organic food purchasing programme, limited use of biofuels and lack of consideration of sustainability in staff hiring decisions. In terms of the policy and written statement function category NMMU George was also having general success. The student involvement functional category showed the worst performance. Only the area of orientation and awareness programmes were highlighted as doing well in this category. The results of the overall USAT assessment of the NMMU George Campus in 2011 can be graphically seen in Figure 1.
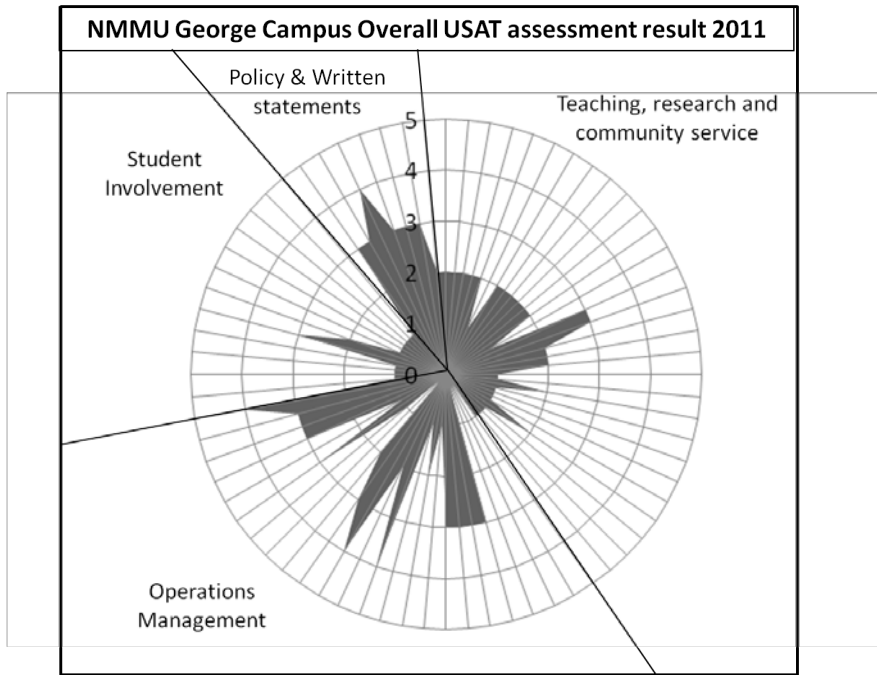
Figure 1: NMMU George Campus USAT Assessment Results (2011 assessment)

In order to better understand the poor performance reflected in student involvement a USAT assessment of the specific student involvement category was performed. The results of which are provided in Figure 2 and show poor performance in most categories of assessment except for orientation and awareness programmes which do take place.
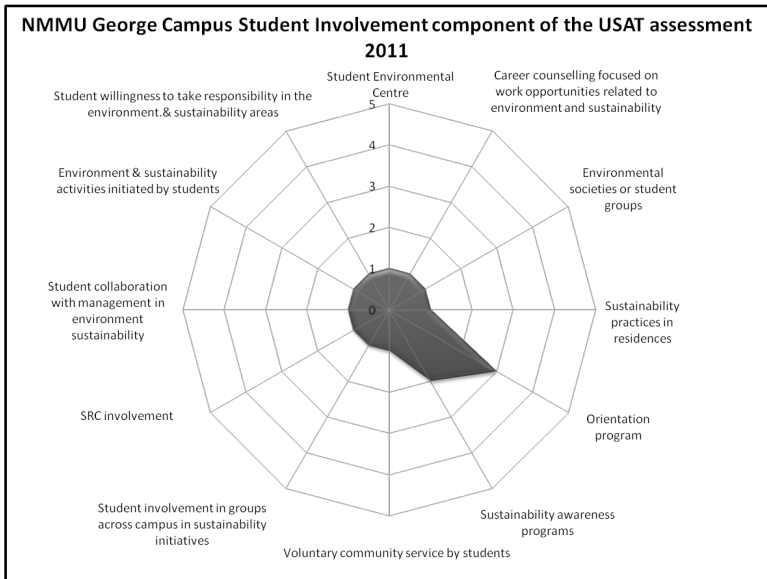
Figure 2: Student Involvement Section of the NMMU George Campus USAT Assessment Results (2011 assessment)

GCI Student Survey Assignment Results for 2010

In order to further understand the reasons behind the lack of student involvement in the Green Campus Initiative (GCI) on the George Campus two surveys were conducted in 2010 and 2011 by the second year Nature Conservation Communications students as a course work assignment.

Student survey results 2010

During the first semester of 2010 the first year conservation communication students were asked to set up a questionnaire and interview students from other disciplines to determine the understanding, perceptions and opinions of the NMMU students regarding the GCI on the George Campus. It must be noted however that in no way can the results be considered scientifically rigorous. This report is merely a random collection of comments from a random selection of students. The assignment was an individual effort of 54 students who did not collaborate with each other in terms of the survey questions or format. Each individual student set their own questions and interviewed five other NMMU students studying anything but nature conservation. This resulted in a total of 270 questionnaires on which the results were based.

The feedback from the students was both positive and negative. The most striking feature was the lack of understanding or misinformation regarding the GCI, along with some services the NMMU provides the students and staff. There were a large percentage of students who were unaware of the GCI and its projects or who had an understanding of what it actually was. Most students felt that more needed to be done to inform the students of the initiative, and that all of the schools on the campus should be included.

There were also a number of valid recommendations made by the student body. This demonstrated their willingness to be involved in the decision-making process. They felt that they were not involved enough and that they were only expected to do all of the work. Essentially, the students wanted to be part of the GCI but indicated that initiatives should not take up too much of their time.

Student survey results 2011

Yet again, during the first semester of 2011 the first year nature conservation communication students were given an assignment to survey knowledge, understanding and attitudes of students from other disciplines on the NMMU George Campus regarding the GCI. This time, each student was given five questions to include in their survey and allowed to construct five of their own questions for the survey. It must yet again be noted however that in no way can the results be considered scientifically rigorous. The assignment was an individual effort of 31 students who did not collaborate with each other in terms of the survey questions or format. Each individual student set their own questions and surveyed five NMMU students studying anything else but nature conservation. The assignment consisted of 310 surveys.

When asked if they had heard of the GCI only 14.38% of the students said they had, stating they had been informed through the orientation week, word of mouth, during lectures and through email notifications. When asked if they would be prepared to get involved with the GCI 19.28% said yes. Of the students who said no, the common responses of why included "Not really their field of studies", "Did not know how to contribute to the GCI", and being "Unsure of what would be expected of me". What is encouraging from the results compared to the 2010 results is that students were far more aware of sustainability practices taking place on the campus grounds.

The USAT assessment results and the findings from the 2010 and 2011 student survey both showed a lack of student participation, lack of understanding and knowledge of the GCI and a call for more information and advertising regarding GCI activities. The assessment results drew attention to the need for the NMMU Student Mobilization Change Project.

NMMU Student Mobilisation Change Project (2011/12)

From the results of the baseline assessment, which included the USAT assessment and student survey it was decided that the focus of the SIDA ITP Change Project was appropriate. Therefore the NMMU Student Mobilization Change Project was aimed at eliciting student support for sustainable development on the NMMU George Campus providing a platform for student initiated projects, collaboration with campus management and to provide a collective student voice on sustainability issues on the campus and surrounding area.

The objectives required to achieve the student mobilization aim were set as:

1. The sourcing of students from a variety of disciplines wishing and able to form a committee for the GCF.
2. Establishment of a committee succession plan to ensure that the forum activities continue from year to year independent of the transitionary nature of its student body.
3. The formal registration of the forum as a student society on the Campus.
4. The sourcing of funds is an integral aspect for the revival and sustainability of the GCF.
5. Capacity development in order to empower the elected student body to undertake the endeavour.
6. Eliciting institutional support for the GCF

Integral aspects for the revival and sustainability of the GCF at the time were its formal registration within the NMMU systems and structures so as to enable the forum to access funding streams. The Forum also needed to establish channels of communication via social networking sites and a website and other communication outputs such as an annual newsletter. Another vital aspect of the revival was the establishment of a committee succession plan to ensure that the forum activities continue from year to year independent of the transitionary nature of its student body. The NMMU Student Mobilization Change Project as an output of the ITP ESD in Higher Education was achieved over the period of a year, which involved the following phases of activity and interaction.

Phase 1

Phase 1 of the NMMU Student Mobilization Change involved start up discussions about the initial focus area for the NMMU SIDA ITP Change Project, which was undertaken between the George Campus Principal and SIDA ITP participant. At this meeting it was confirmed that the focus of the NMMU SIDA ITP Change Project would be on student mobilization were efforts to revive and establish student participation in the GCI on the NMMU George Campus would be aimed for. From this meeting a rough and initial plan for the project was formulated.

Phase 2

Phase 2 occurred over a two week training programme in Sweden where the SIDA ITP participant critically analysed work on ESD in Sweden, Asia and Africa. Group work with other institutions focusing on similar change projects was undertaken and further group work presentations were also delivered. The initial NMMU SIDA ITP Change Project plan developed in Phase 1 was presented during the training programme for peer and tutor review.

Phase 3

Phase 3 of the NMMU Student Mobilization Change Project involved determining a baseline position of ESD in the institution. The Unit-based Sustainability Assessment Tool (USAT) and surveys of student knowledge, understanding and attitudes to sustainability practices and projects on the campus were used for the assessment, the summary results of which were presented above. This then led to a number of expanding interventions and activities, two of which were significant in this phase of the programme.

- *Green Campus Forum Revival*

With student mobilization in mind a call for students from both the School of Natural Resource Management and the School of Business at NMMU George Campus who wanted to participate and play a leading or organization role was sent out to the student body in 2011. This was a starting point in order to gather an interdisciplinary leadership group for the GCF. All respondents were invited to a brainstorming workshop where the interested parties openly discussed what they would like the GCF to achieve and a GCF Committee was voted in.

- *NMMU Student Mobilisation Indaba*

The NMMU Student Mobilisation Indaba was hosted in September 2011. The event marked the coming together of three academic institutions (Nelson Mandela Metropolitan, Rhodes and Uppsala Universities) to

think tank student mobilization and a student response to education for sustainable development on campuses in South Africa and Sweden. Each university student body was given an opportunity to highlight the particular activities taking place within their own institutions and network with others institutions. Overall the indaba contributed to the future visioning of the GCF and provided examples of what other institutions had achieved. Not only did it assist the forum to develop their vision and mission but also established links with a broader community of practice.

Phase 4

Phase 4, consisted of a SIDA ITP two week regional programme which provided the opportunity to focus developing the plan of action for the change project on student mobilization. Fellow participants, regional resource persons, the regional coordinators and mentors were in attendance to support work undertaken during the two-week programme. Members of the GCF committee accompanied the SIDA ITP participant to the two-week programme to undertake the following actions:

- Formulation of a vision and mission for the GCF
- Formulation of a constitution for the GCF
- Formulation of a MOU for their members to sign
- Formally submit a university society registration application for the NMMU for the GCF to the NMMU management body.
- Draft a formal succession policy for the GCF to form part of the GCF constitution
- Draft an action plan for activities to be undertaken during 2012
- Establish a social network page and web page for the GCF
- Develop a template of an annual newsletter

The work done during Phase 4 helped to determine the focus of the GCF (vision and mission) and formalized the Forum management (constitution, MOU, action plan and communication mediums). Furthermore, the formal registration of the forum facilitated it becoming imbedded into a greater system, which allowed the student society to access funding streams and resources.

Phase 5

Phase 5 was focused on the planning and implementation of a final seminar and evaluation of the change project, which is founded on all the planning and preparation done in the preceding phases. This phase also included an evaluation of and a reflection on the process of the change project.

- *Final seminar*

A university-wide seminar was successfully facilitated in April 2012 and took the form of an "Agent of Change" workshop, which focused on developing capacity in the student society leaders on the NMMU George Campus. Members of the GCF engaged with academics to plan training for the students at the workshop. The particular training involved presentations and exercises or activities in communication, being an "Agent of Change" and stress management. Opportunities for networking and getting to know each other were provided and several open discussions related to training needs were forthcoming. As a starting point the student leaders identified the following training requirements:

- Society management and administration
- Fundraising
- Financial procedures and budgeting
- Emotional intelligence
- Conflict resolution
- Time management
- Media outputs and marketing

The workshop culminated in a way forward where responsible individuals were appointed to coordinate an annual calendar of training events timed to occur when new annual committees of student societies are elected and a handover of responsibilities takes place. It was also mentioned that the calendar of events will be evaluated annually and remain flexible and responsive to the current society leadership needs.

The final discussion in the workshop was an exercise in reflexivity where participants were asked what lessons they have gained through the workshop and what the implications of the lesson would be to their leadership and involvement in the their respective societies. Informal discussion by student leaders resulted in the initiation of a partnership between the GCF and the Speakers Club who undertook to support each other's events and to feed into each other. For example the GCF would provide sustainability topics for debate and speeches.

The Agent of Change workshop assisted the NMMU George Campus Student Mobilization Change Project by developing the capacity of student leaders of societies on the campus to be change agents and leaders. It greatly benefited the GCF Committee in that it assisted them to establish ties and alliances with other student societies and key stakeholders such as members of the Student Representative Council. The workshop also initiated an annual calendar of capacity training programmes, which remains flexible and responsive to the needs of current leadership.

ESD considerations

The GCF when it was revitalised in 2011/12 drew its membership from the Schools of Natural Resource Management and Business thereby transcending the conventional divide between disciplines. It brought together individuals from a diversity of backgrounds and interests. As members of the same society the diversity of individuals all worked towards improving sustainability but from different perspectives where diversity is seen as a strength contributing to the same goal. Also, because the actions undertaken by the forum are determined by the committee and its members no particular focus in terms of environment, society and economy dominates; instead the actions and projects undertaken by the GCF are intrinsically interdisciplinary.

This larger scope in disciplines furthered the success of projects, the understanding of the holistic nature of sustainability, and the inclusion of students from diverse backgrounds without alienating the less environmentally-inclined members of the student body or reinforcing a common misconception that disciplines are separate from one another (Newport et al., 2003; Pike et al., 2003; Cosgrove Group, 2003).

As indicated above, the Southern African Development Community identified the need to strengthen leadership to be more able to respond to socio ecological challenges and noted that educational leadership training programmes were needed. The NMMU George Campus Student Mobilization Change Project has responded to this by showing how an interdisciplinary approach, supported by an annual capacity development programme could address this need, and remain responsive to the needs of its beneficiaries. Critical to further development of this approach was implementing an annual monitoring and evaluation system which allowed the project to be reflexive of its work.

Monitoring and evaluation

A range of evaluations including specific outputs of the GCF, the USAT assessment tool, an annual student survey and the GCF Chairperson Annual Report were used to evaluate the success of the NMMU George Campus Student Mobilization Change Project. Having a diversity of evaluation methods and perspectives provided a more rigorous and thorough evaluation of the project.

Green campus forum outputs

In order to evaluate particular outputs of the GCF criteria were used to determine success, which includes the successful uptake of leadership positions on the GCF Committee, the amount of enlisted members and the amount of student driven initiatives and projects. A summary of which has been reflected in Table 1. This shows the impact of the GCF initiative, especially in the expanded committee structure, expanded numbers of participants, and an expanded number of student-driven initiatives. Data after 2011 showed this pattern to have continued.

Table 1: Green campus outputs between 2010 and 2014

Criteria	2010	2011	2012	2013	2014
GCF Committee	Chairperson Secretary	Chairperson Vice Chairperson Treasurer Secretary Spokesperson	Chairperson Vice Chairperson Treasurer Secretary Spokesperson	Chairperson Vice Chairperson Treasurer Secretary Spokesperson	Chairperson Vice Chairperson Treasurer Secretary Spokesperson
GCF Members	12 – 13	87	176	86	64
Initiatives	• Tierkop Research Project • Vermiculture Project *All **staff** driven	• Tierkop Research Project • Vermiculture project • Paper Cup Campaign • Arbor Day Planting • George 200 Expo • Green Campus Awareness Week • Green Economy lecture • George Dam Clean Up Day *All student driven	• Earth Hour event • NMMU Africa GCI Conference • Radio interview • Fynbos festival at botanical gardens • Science Expo at Glenwood School • Campus Clean ups • Blue Bin Campaign • Back to back printing drive *All student driven	• Earth Hour event • Pledge wall event • Various day hikes *All student driven	• Tree planting at local George School • Botanical gardens Raucous Toad campaign • Cultural celebration day • WESSA beach clean up • Watsonia garden planting *All student driven

Some examples of the activities implemented by the students in 2011, 2012, 2013 and 2014 are briefly described below.

Tierkop Research Project (2011): This project involved students in an action research study where "green" technologies, including solar water heating systems were tested in a number of student houses and compared with data gathered from student houses that had not been fitted with these technologies. One of the aims of the project was to develop the George Campus as a demonstration site for sustainable living. The funding for this project ended and the project is no longer active but the data is still been used for educational and student orientation purposes.

Vermiculture project (2011): This project consists of the establishment and maintenance of a vermi-culture operation on the campus. The site is located in the vicinity of the waste dumping site and is adjacent to a newly established nursery and traditional composting facility. Waste generated by the campus kitchens was used to produce vermi-culture products utilized in the nursery and for the purposes of a masters research project. The project was used as a site for teaching and learning where researchers were invited, data gathered and disseminated through environmental education opportunities to NMMU students and schools within the George area. The established vermi-culture operation has been handed over to the agricultural department to be used as a teaching and learning site.

Plantings (2011 / 2014): This project involves the students in greening the campus and surrounding areas. Members of the GCF are invited to plant trees on the campus and local schools contributing to green corridors on the campus and surrounds. These plantings often take place on Arbor Day every year and are ongoing. In 2014 the GCF arranged the establishment of a Watsonia garden.

Back to back printing drive (2012): The GCF were proud to influence the selection of printers to be bought by the student council that print on both side of the paper to reduce printing quotes and to reduce the use of paper. This project extended into a campaign to encourage the university to provide learning material (notes) printed on both sides of paper.

Fynbos Festival (Botanical Gardens) (2012): This project involved the GCF members in the Fynbos festival at the Garden Route Botanical Garden where they had a stand informing the community about the GCF and sustainability issues on the campus.

Earth hour events (2012 / 2013): The GCF participate in the worldwide Earth Hour events by encouraging members and hostel residents to refrain from electricity use for one hour. Members are also encouraged to pledge to keep the environment green at the event.

Clean up Days (2012/2014): The GCF regularly organize clean up days on the campus and in surrounding landscapes such as the beach where members pick up litter. Clean up days are ongoing.

USAT Sustainability Assessment Tool

The primary evaluation involves the USAT sustainability assessment tool which was used to undertake the baseline assessment of student involvement in sustainability at the NMMU George Campus in Phase 3 of the change project process and is therefore most fitting for the final evaluation. This allows for a comparison of the status quo in 2011 and 2012. The results of the 2012 USAT assessment for the student involvement component are found in Figure 3.
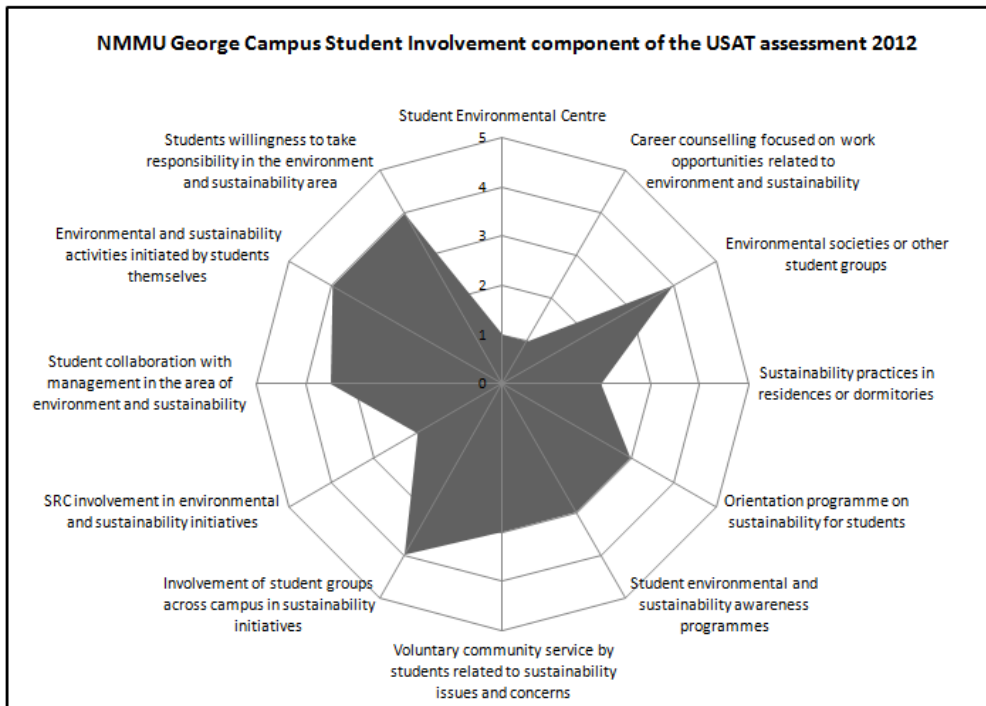
Figure 3: Baseline USAT assessment results (2012)

In Figure 2 the NMMU George Campus Student Mobilization Project Baseline assessment of sustainability related to student involvement conducted in 2011 showed severe deficiencies in all areas except in the area of an orientation programme and sustainability awareness programmes. The 2012 USAT evaluation results from 2012 (Figure 3) in comparison to 2011 (Figure 2) shows a great improvement in most areas. Efforts still however need to be made in establishing an Environmental Centre and in terms of career counseling focused on work opportunities related to environment and sustainability. The 2012 USAT evaluation was the final evaluation for the SIDA ITP Change Project. Despite recommendations that the GCF use the USAT tool to evaluate annual progress it has not been readily taken up by the GCF committee.

Green Campus Forum Annual Chairpersons Report

The outgoing Chairperson of the GCF is required to produce a handover report to the incoming Chairperson and was also consulted in terms of evaluating the success of the change project. The evaluation report serves to reflect on the forum activities and the intention is that these will inform the planning for the New Year and will be an annual output expected of the outgoing Chairperson. The insights provided by the Chairpersons annual report for 2012 provided the perspective of the forum management.

The monitoring and evaluation instruments have proven to be useful for tracking progress being made in the GCF and its activities, and also for ensuring continuity and ongoing improvements in practice. This is vital to reduce the problem of fragmentation that often plagues student-led initiatives as students 'move on' after their degrees and new students come in to take over initiatives.

Action Planning and Way Forward

As can be seen from the above, the ITP change project helped the GCF to become well established and imbedded into a greater structure ensuring its sustainability as a society at the NMMU George Campus. This choice in structure proved to be an integral aspect of the sustainability of the forum. The formalization of the Forum supported with guiding documents has helped to contribute to the sustainable management of the

entity as shown by the fact that the activities of the forum have continued, beyond the ITP change project implementation window of 2011/12. A succession order and process was put in place, forming part of the society constitution ensuring the continuation of the forum.

Despite recommendations to utilize the USAT for determining areas of focus beyond 2012 the GCF did not readily take up the use of the tool nor has a formal annual report been forthcoming. The 2013 and 2014 committees rather chose to utilize feedback meetings as a form of reporting instead. The informal report back in 2013 and 2014 have shown the GCF to have a continued management committee, membership and projects and programs related to sustainability issues on the campus and surrounding areas.

Conclusions and reflections

As shown above, the NMMU SIDA ITP Student Mobilization Change Project has successfully mobilized the student body for sustainable development on the NMMU George Campus. The student driven forum allowed students to begin engaging in a number of their own initiatives. They started to work more closely with the NMMU operations management thereby influencing the sustainability practices on the campus. Furthermore the GCF also started involving themselves in a number of projects with the wider community and environments, as is shown in the list of the GCF activities outlined above.

What was initially a 'change project' planned for one year, facilitated the establishment of a student driven platform for student involvement in decision making regarding sustainability practices on the campus and beyond which has extended beyond the initial one year period, showing its catalytic effect.

Towards the end of 2010 the GCF was informally established by the NMMU staff with little buy in from the student body. This was reflected in an inactive membership body comprised of a handful of purely nature conservation students. By the first half of 2012 the picture was different, and since then The GCF has continued to develop and entrench, allowing for ongoing student innovation and participation in sustainability issues.

The GCF was revived and became completely student driven with a membership of 176 students in 2012 from a diversity of disciplines. The sustainability of the GCF is evident despite a drop in membership and activity in 2013 which can be attributed to a collapse of leadership when the Chairperson left the university in the middle of the year and a "cleaning up" of the membership list were only active members remained on the list in 2014. The GCF was also robbed of their funds in 2013 which stifled any activities besides fundraising within the year. Despite the 2013 disturbance the GCF remains resilient and active in 2014 but is not immune to disturbances.

Certain elements were integral in the success of the change project. The formalization of the GCF through the formal registration of the society and the development of management documents such as the constitution and membership memorandum of understanding has ensured its sustainability. This is achieved also by including an annual management succession process in the forums constitution and embedding it in a greater system giving it access to funding streams and a support structure. The support and demonstrated commitment from the NMMU operations and academic management was an integral part in motivating the committee and instilled a sense of agency in the students. This continual management support is important for the sustainability of the forum.

The GCF established a governance structure that was student led, but university supported. By registering with the university administration and embedding the forum into a greater structure, funding and resource streams also became more accessible. The forum itself also undertook to organize fundraising events with great success, demonstrating a degree of ownership of the forum and responsible management. Both the income derived from NMMU as an active society and the fundraising efforts of the students themselves now ensure the forums financial sustainability. Furthermore, the development of several key documents

(constitution, MOU, project plan) provided a structured base to operate within as well as placed a continuous succession plan into play further ensuring the GCFs sustainability. The USAT Assessment tool proved to be a very useful instrument for monitoring and evaluation of the NMMU Student Mobilization Project as part of the SIDA ITP.

The NMMU Student Mobilization Change Project set out to achieve several objectives, namely 1) to source students from a variety of disciplines to form a committee for the GCF revival, establish a committee succession plan; 2) formally register the forum as a student society on campus; 3) empower the elected student body through capacity development; 4) sourcing funds for the GCF; 5) eliciting institutional support for the GCF. Each of the objectives were achieved and greater wins have further been realized. An active and sustainable student body for sustainability on the NMMU George Campus and its surroundings has been formed and as shown by the continued engagement taking place in the GCF, this is influencing the awareness and attitudes towards sustainability issues of the students on the campus over multiple years and across student cohorts.

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Chapter 13: Education For Sustainable Development: The Case Of Masinde Muliro University Of Science And Technology (MMUST)

Patricia Kariaga, Mary Goretti Kariaga and Vitalis Ogemah

(Musinda Muliro University of Science and Technology, Kenya)

Abstract

This chapter reports on the institutional audit that was undertaken at Masinde Muliro University of Science and Technology (MMUST), Kenya, and the subsequent steps that have been developed and undertaken towards Education for Sustainable Development (ESD) within MMUST. The Unit-based Sustainability Assessment Tool (USAT) was administered between January and March 2012. The audit on teaching, research and community engagement activities at Masinde Muliro University of Science and Technology (MMUST) revealed the need for resource mobilisation to enhance performance in the areas of community engagement, research and scholarship activities that scored lowest. Need was also identified for increased sensitisation with regard to ESD planning and implementation. The ESD research team subsequently embarked on consolidating on-going work related to the university's proposed ESD Vision for the next decade (2015-2025): A green Campus At Masinde Muliro University of Science and Technology. Since the university is situated within the Kakamega tropical forest belt, the researchers make use of Kakamega Tropical Forest Ecosystem in collaboration with the Kakamega Environmental Education Programme (KEEP) and the Kenya Forestry Research Institute (KEFRI) in advocacy, education and research to alleviate poverty and conserve the rich biodiversity. The team realises that one of the drivers of environmental degradation is the use of inappropriate technologies, unsustainable consumption and reduction patterns. Another concern is the use of inappropriate technologies and loss of biodiversity. The use of appropriate technology will be encouraged by using the local environment as a science laboratory for conceptual learning. Additionally, Science and Engineering students are working with *Jua Kali* (informal industries). Other students are also involved by gathering indigenous knowledge and conserving seeds of endangered species.

Introduction

The Republic of Kenya (2008) describes Education for Sustainable Development (ESD) as "education that enhances sustainable development" and its mission is "to provide an enabling environment and capacity for all sectors and stakeholders to contribute effectively towards the achievement of sustainable development" (p. 13). ESD provides *learning goals* that can help governments and development partners to ensure that capacity exists for achieving the Millennium Development Goals (MDGs) (UNESCO, 2008). Education and learning lie at the heart of approaches to sustainable development and are therefore also matters of concern in higher education, as this chapter discusses in more detail.

Education for Sustainable Development in Kenya

As a response to the UN's DESD declaration, Kenya developed a national ESD strategy in 2008, supported by the National Environment Management Authority (NEMA). The strategy outlines the implementation of and

vision for ESD in the Kenyan context and presents ways to engage in change for the sake of sustainable development. The implementation and coordination of ESD is carried out by means of seven strategies:

1. advocacy and vision-building;
2. consultation and ownership;
3. partnership and networks;
4. capacity-building and training;
5. research and innovation;
6. the use of information and communication technologies (ICT); and
7. monitoring and evaluation. (Republic of Kenya, 2008)

The implementation of the ESD strategy was also aided by the establishment of several Regional Centres of Expertise (RCEs), one of which is located at MMUST (Republic of Kenya, 2008). RCEs were established by the United Nations University in 2005 to achieve the goals of the DESD by translating its global objectives into the context of the local communities in which they operate (UNESCO, 2011). This has implications for the role of universities that are involved in RCEs, as will be discussed below in more detail.

Additionally, in line with the DESD principles, the Kenyan Ministry of Environment and Mineral Resources (MEMR) published the National Education for Sustainable Development Policy in 2011. According to Republic of Kenya (2011), the goal of the policy is to achieve "education that enhances sustainable development in Kenya" (p. 10). This emphasis on ESD in Kenyan education includes higher education institutions, such as the Masinde Muliro University of Science and Technology (MMUST).

ESD at Masinde Muliro University of Science and Technology (MMUST)

From 2009, the newly appointed Coordinator of RCE Kakamega Western Kenya and other members of the RCE began ESD activities in collaboration with the Deputy Vice Chancellor (DVC)'s Office of Academic Affairs at MMUST. Activities have centred on building partnership and collaboration in order to spearhead ESD activities at MMUST and in the western Kenya region. Subsequently, a twenty-member Working Committee was formed in February 2012, including MMUST lecturers, students and community members from Kakamega, under the office of the DVC Planning Research and Extension (PRE). The committee is known as the MMUST ESD Research Project Committee.

During Phase 1 of SIDA's International Training Programme (ITP), the MMUST ESD Research Project Committee carried out an audit of the MMUST curricula of all centres, faculties and schools. The activity was urgent as the committee needed to design strategies in regards to ESD/MESA initiatives. Baseline information was therefore important. The assessment at MMUST would reveal levels at which sustainability concepts and issues were being addressed. As noted above, a national ESD strategy was developed for Kenya by the NEMA in 2008. This national ESD strategy offers some action-oriented strategies to guide stakeholders towards sustainable development (Republic of Kenya, 2008), but it does not provide guidance on generating baseline information in universities. Several studies have been undertaken in other parts of the world that have shown the need to conduct an audit as a first step and a basis for identifying points of weakness in mainstreaming sustainability into academic programmes and for planning for improvements (e.g. Lozano & Peattie, 2011; Matarazzo-Neuberger & Filho, 2010; McMillin & Dyball, 2009). This research formed part of the road map to achieving the DESD objectives at MMUST, in Kenya and internationally.

This chapter discusses the audit results and outlines strategies suggested by the MMUST team in an attempt to reach the university's ESD vision. The ESD research team at MMUST has consolidated material by different researchers that will help the team to achieve the next decade Vision (2015-2025): *A green Campus At Masinde Muliro University of Science and Technology*.

Institutional audit of MMUST

The Unit-based Sustainability Assessment Tool (USAT), developed by Togo (2009) and published by Togo and Lotz-Sisitka (2009), was used as a framework to gauge to what extent environmental sustainability in teaching, research and community engagement had been embraced at the university. The USAT allows universities to reflexively review their progress in engaging with environmental and sustainability concerns. The USAT also allows for unit-based assessment at the level of departments and for different activities (e.g. policy, student activities, community engagement) within universities. It is a flexible tool that can also be contextually adapted to the institution and/or national context in which it is used. With the aid of this tool, the MMUST was audited within the first three months of participation in the ITP. The audit results formed a foundation for conceptualising change initiatives in the university.

Research aim and objectives

The main aim was to audit the curricula at Masinde Muliro University of Science and Technology (MMUST) in order to establish their quality regarding sustainable development with the intention to strengthening them and improve the weaknesses. More specifically, the objectives were:

1. to establish the level at which academic faculties at the MMUST offer courses that deal with sustainability concerns;
2. to determine the extent to which staff and students in academic faculties of the MMUST are involved in research and scholarship activities in the area of sustainability; and
3. to establish the level of involvement of academic faculties at the MMUST in sustainability-related, community engagement activities.

Methodology and design

The study adopted a survey-research design in which the respondents were interviewed, guided by a structured questionnaire. The audit targeted the entire MMUST. The study population came from the university's twenty-four departments, organised into six faculties, schools and centres (hereafter referred to as *faculties*). These are the Faculty of Education and Social Sciences (six departments), Faculty of Science and Agriculture (five departments), School of Health Sciences (six departments), Centre for Disaster Management and Humanitarian Assistance (CDMHA) (four departments), and Faculty of Engineering (three departments).

The unit of analysis was the department. The census method of data collection was adopted and one respondent from each department was interviewed. The respondents were Heads of Department, since they were assumed to have sufficient information about their departments. To supplement information from the interview, content analysis of course outlines and examination papers, as well as other evidentiary documents, was conducted to confirm and extend the information captured by the USAT.

Part A of the USAT was used for this research. It has six indicator clusters: curriculum, teaching approach, research and scholarship activities, community engagement, staff expertise and willingness to participate in sustainability teaching and research, and, lastly, examinations and assessments. The responses in Part A were scored on a scale of 0 to 4, where 0 denoted a lack of sustainability, 1 indicated little sustainability, 2 represented adequate sustainability, 3 showed substantial sustainability, and 4 meant a great deal of sustainability (Togo & Lotz-Sisitka, 2009). Data obtained was summarised in tables and was analysed by determining sums, means, and percentage-sustainability levels. The data was presented in the form of radar charts.

Results and discussion

The results are discussed in two subsections, namely the sustainability performance of the university in general and the sustainability performance of the individual faculties.

General performance by Masinde Muliro University of Science and Technology (MMUST). The general performance of MMUST in respect to ESD in its core business of teaching, research and outreach rated 2.04, corresponding to 50.90% across all indicators (Figure 1). The university performed best in the teaching approaches cluster of indicators (T7—T1l), where the average score was 3.08 (77.12%), while the worst performing cluster of indicators was for community engagement (El8—E22) at 1.52 (37.88%). Thus, the university appears to adequately embrace sustainability or sustainability-oriented teaching approaches, such as critical thinking, in its teaching. This may have been supported by the existence of the Faculty of Education, which offers courses in teaching methods, and by the practical nature of several programmes offered in the various faculties, given that the MMUST is a science and technology institution. The USAT suggests that teaching approaches that integrate theory and practice and that embrace critical thinking and active involvement of students in the learning process are more strongly oriented to sustainability teaching (Togo & Lotz-Sisitka, 2009).
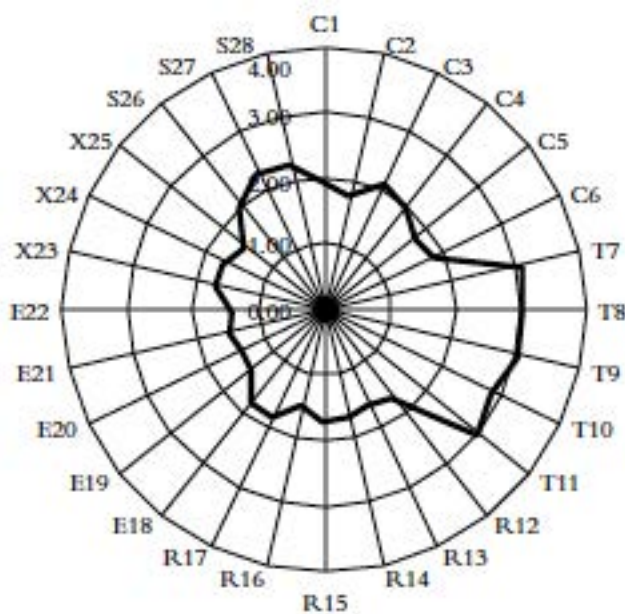

Figure 1. Sustainability performance of the Masinde Muliro University of Science and Technology

The next best performance result was in expertise and willingness to teach and research on sustainability issues, which thus showed an interest in these issues amongst staff of the university. These two clusters of indicators were the only ones that scored above average. There is, however, need for improvement in the university's sustainability engagement in respect of all clusters of indicators. Curriculum assessment showed a need to integrate more sustainability issues across all faculties. Although teaching approaches performed better, there is still room for improvement. The university should also work hard with regard to community engagement, as well as examinations and research and scholarships. The poor performance of these aspects may be attributed to limited funding at the university.

Sustainability performance of university faculties, centres and schools. There were clear differences in the performance of the faculties with respect to the key sustainability indicators. For example, the sustainability performance for the Faculty of Education and Social Sciences, shown in Figure 2, was generally above average, with an average sustainability score of 2.35 (58.63%).
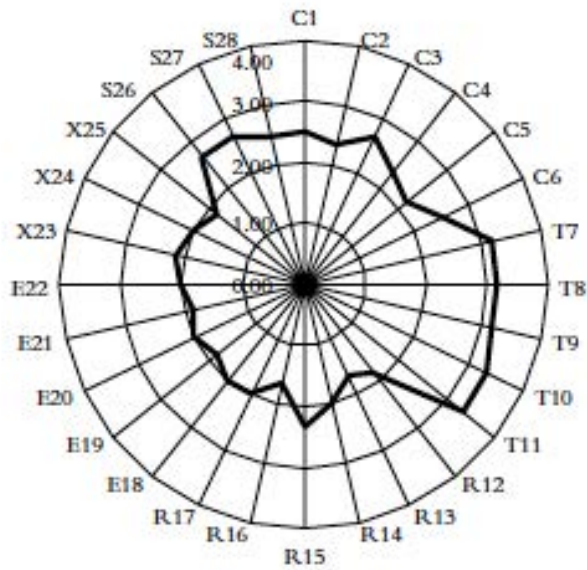
Figure 2. Sustainability performance of the Faculty of Education and Social Sciences

The faculty rated highest in the teaching approaches cluster (T7—T11), in which all indicators scored between 3.17 and 3.33 out of a possible maximum score of 4. This can be explained by the fact that the faculty trains teachers and is thus likely to have integrated sustainability concerns in its curriculum. The lowest performance was recorded in the research and scholarship cluster (R12—R17), where scores ranged from 1.68 to 2.33. The lowest score was returned by the degree to which global sustainability issues and challenges form part of the faculty's research (R13). This could be due to the faculty mostly engaging in training teachers whose curriculum is highly localised and who specifically use local content. There is a need for the faculty to address this concern by integrating global issues in its research and scholarship activities.

The Centre for Disaster Management and Humanitarian Assistance (CDMHA) scored an average sustainability performance score of 2.99 (74.8%) out of a maximum of 4, see Figure 3. This can generally be regarded as a good score, more so because the performance distribution was relatively uniform.
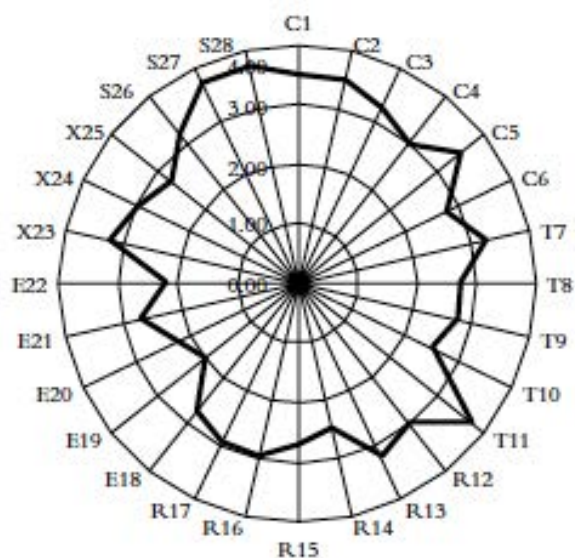

Figure 3. Sustainability performance of the Centre for Disaster Management and Humanitarian Assistance

The clusters that scored almost entirely within the highest quarter were curriculum (CI—C6), which ranged from 2.75 to 3.5, and staff expertise and willingness to participate (S26—S28), which scored between 3.25 and 3.75. The fairly high performance of the Centre can be explained by the nature of the programmes that it is involved in, as these have major sustainability objectives. In most of the programmes, the Centre aims at managing disaster and providing for sustainable solutions to avoid recurrence. The lowest score (2.0) was in the community engagement cluster and corresponded with the indicator showing the level of commitment of the Centre's resources in sustainability projects in the community (EI9). By focusing on this area, the Centre could expand the impact of its teaching programmes to communities surrounding the university.

The sustainability performance of the Faculty of Engineering is given in Figure 4. The average performance score was 2.81 (70.24) out of a maximum of 4. The performance within the indicator clusters was mixed, with the teaching approach cluster (T7—T11) scoring highest (3.3—4.0) and the community engagement cluster (EI8—E22) scoring the lowest (1.67—2.67).
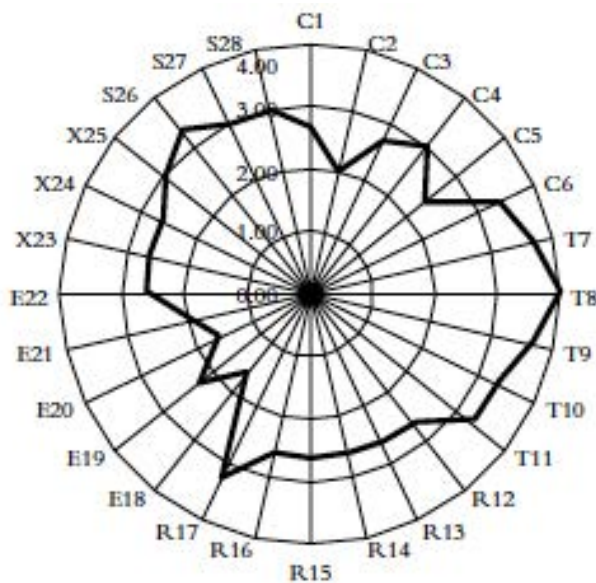
Figure 4. Sustainability performance of the Faculty of Engineering

This faculty emphasises a practical teaching approach, which may have contributed significantly to the high performance in the teaching approaches cluster. Within this cluster, the faculty received the highest possible score regarding the critical thinking skills indicator (T8), which is most probably due to the nature of solutions that the programmes in the faculty have to offer. There is a high demand for originality, ingenuity and innovation in the faculty's programmes. All the same, there is need for improvement in the areas where the score was low, especially community engagement. The faculty ought to consider making use of the high critical thinking potential to address community problems in addition to providing global, industrial solutions. This would be in line with Sterling's (2001) view that sustainability logically necessitates a deep learning response in educational thinking and practice and anticipative education, recognising the new conditions and discontinuities that face present generations.

The Faculty of Science and Agriculture is actually two faculties, but they were considered as one for the purpose of this study, based on the fact that they previously functioned as one faculty. The sustainability performance of the faculty is given in Figure 5.
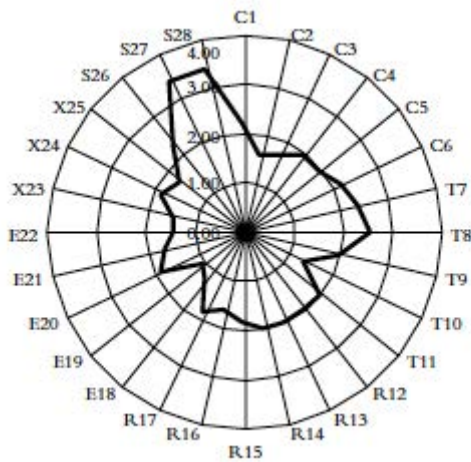
Figure 5. Sustainability performance of the Faculty of Science and Agriculture

Performance was mixed, with a mean score of 1.93 (48.35%). The only cluster of indicators that scored more than 75% was staff expertise and willingness to participate in sustainability-related education. The clusters in respect to curriculum, community engagement and examinations were particularly poor, which shows that staff willingness was not being translated into teaching practice or community engagement activities. The indicator with the lowest score was the level of commitment of the faculty's resources to sustainability projects in the community. The poor performance of the faculty could be attributed to the rigidity of the programmes offered and the type of knowledge on offer in the faculty. It offers mainly basic sciences, e.g. physics, chemistry and mathematics, which are universally designed with little flexibility. This deviation from other faculties also underscores the need to recognise existing differences in the nature of the disciplinary programmes offered by different faculties and the obligation to offer courses that may have little or no relation to sustainability. This does not mean that there are no possibilities to integrate sustainability concerns in ways that are discipline-congruent.

Lastly, the sustainability performance of the School of Health Sciences was far below average, see Figure 6. The average score for the School was only 1.06 (26.5%) out of a maximum possible score of 4.

Figure 6. Sustainability performance of the School of Health Sciences

The scores were less than 25% for most of the indicators. The only indicator cluster that recorded a high score (3.17—4.0) was teaching approaches. Two indicators i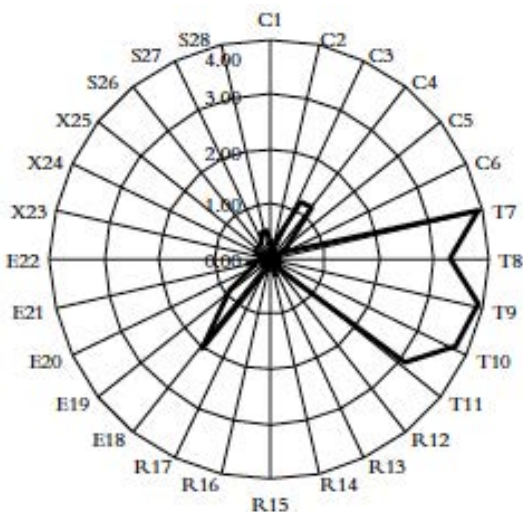n this cluster, i.e. capacity to make informed decisions (T7) and a sense of responsibility (T9), even recorded the highest score possible. Similar to the Faculty of Engineering discussed above, this again relates to the practical nature of the courses offered in the School. The health-related courses require a high degree of practical application, personal judgement and critical thinking. Performance in all the other clusters was below average. The lowest score was 0.17 (4.25%), recorded in five indicators (CI, R13, R15, R16, E22). The low score in the research cluster could be related to the nature of research undertaken, which is highly specific with a very high degree of ethical consideration. Also, with a stronger focus on social sustainability (rather than environmental sustainability), this score may well have looked entirely different. This may also explain the low score for community engagement and the staff expertise and willingness clusters, despite the considerable evidence that was gathered showing that the School was seriously engaged in community work in the areas of public health and nutrition, and dietetics. Thus the most probable explanation of the ratings could lie in the respondents' understanding of sustainability concerns. That different faculties tend to interpret sustainability differently was also reported on by Togo (2009), who argued that there is a need to build a common understanding of sustainability across the institution. As mentioned above, sustainability generally refers to the integration of social, economic and environmental aspects. This brings a very important dimension of sustainability education to the fore, namely how the integration of social, environmental and economic aspects within various disciplinary frameworks are to be interpreted and actualised in higher education. This also shows that researchers using USAT and other sustainability tools need to be wary of making judgements based on the assessments, unless underlying concepts used in the assessment tool are clear and are shared by researchers and those participating in the research.

The research team at MMUST undertook a further look at who were involved in ESD-related research in the different departments. Those interested in collaboration were brought on board to strengthen activities for the decade. Overall synthesis of scores is presented in Figure 7 below.
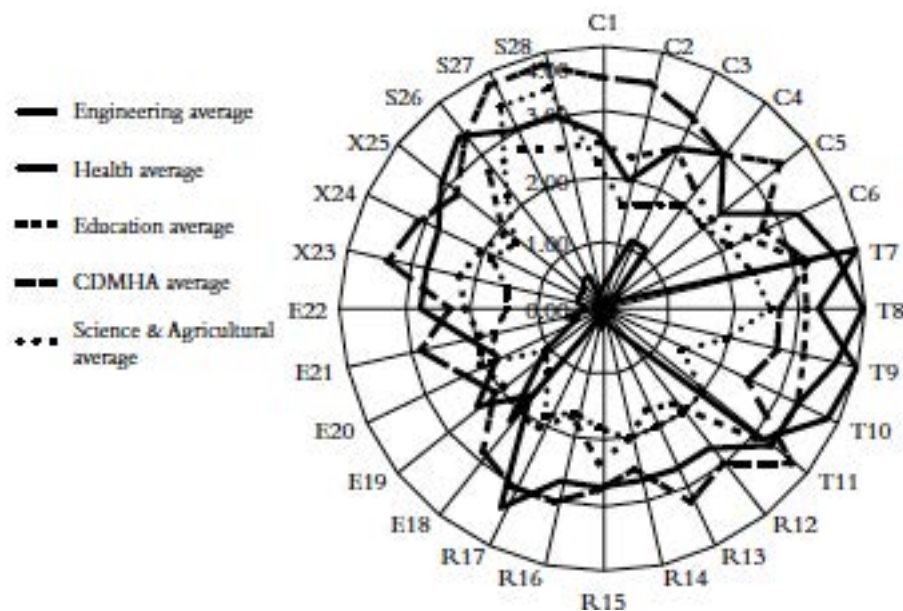

Figure 7 Sustainability performance of the faculties, Centre and School.

Working towards a green campus at MMUST in the next ESD decade 2015-2025

The audit revealed that MMUST's performance in community engagement and in research and scholarship was fairly poor, while the university's performance in teaching performance and staff expertise and willingness to engage in sustainability activities was relatively high. It is encouraging to note that expert manpower exists with a high level of competence to advance the ESD activities at the university. The authors are keen to take advantage of these strengths to promote the weakest points of the university's performance, namely community engagement and research and scholarship in order to enhance the global university performance in ESD.

Objectives and strategies

Guided by the audit results, the ESD team set out to develop a set of objectives and strategies to achieve MMUST's Vision for the next ESD decade (2015-2025): *A green Campus At Masinde Muliro University of Science and Technology*. The following objectives were established:

1. To create awareness and educate different cadres of the (MMUST) population on ESD. This will help to embrace, integrate and implement the principles of sustainable development in the university's operations and encourage changes in behaviour that promote a more ecologically sustainable, economically viable and just society for all.

2. To draft a MMUST ESD Policy, involving all cadres of the university during its development.

3. To create a platform to coordinate all organisations in Kakmega County that have key roles to play in propelling the advancement of ESD practice at MMUST.

4. To use the local environment as a science laboratory for conceptual learning.

5. To involve students in the identification, collection and bulking of seeds of indigenous endangered crops. This activity is carried out as part of student projects. *Student projects* is an examinable course in the Faculty of Agriculture, Veterinary Science and Technology (SAVET).

6. To infuse ESD into the different university programmes. As shown by the audit results, the university has substantial expertise in sustainability matters. This, together with its willingness to engage in sustainability, teaching and research, should be made use of. The audit revealed the university's potential for agency in improving curriculum, assessment, and community engagement activities.

MMUST will develop Environmental Corporate Social Responsibility (E-CSR). Corporate Social Responsibility (CSR) is a concept through which institutions decide to contribute to the creation of a better society by integrating social and environmental concerns in their operations and in their interaction with their stakeholders. The information provided by stakeholders is contributing to the drafting of a MMUST Environmental CSR Policy. Stakeholders include students, prospective students, employees, community, religious institutions, and women and youth groups. The office of the director and the Centre for Kakamega Tropical Forest Studies (CEKATFOS) in conjunction with the World Student Community for Sustainable Development (WSCSD) launched a biodiversity working group in October 2014 that will comprise of staff and students of MMUST who will be engaged in various outreach activities. The WSCSD will be linked to the MMUST Organisation of Environmental Conservationists, who have participated in various clean-up activities and will be rolling out the Eco-schools initiative soon.

Our schools and educators face a compelling responsibility to serve society by fostering the transformations needed to set us on a path to sustainable development in the 21st century. CEKATFOS will adapt methodologies recommended by surveys such as Chidlow (1997) and Chronis (2001), who indicate that certain topics are often named as examples of Environmental Education practice in many schools. The popularity of gardening as a context for Environmental Education is reinforced through the adoption of schools' *Organic Gardens Projects.* The popularity of these kinds of topics differs from some topics common in Environmental Education programmes, for example, population control, acid rain, energy conservation, war, fossil fuels, or disease and hygiene. The report on State of Environment, Kakamega County also devotes several chapters to the issues of air and atmosphere, marine and freshwater, land, and biological diversity, suggesting that these have a special significance to Kenya (NEMA, 2014). CEKATFOS is in the process of developing a directory from the above report on common Kenyan and Kakamega County environmental issues. This will provide a useful index of background resources and information for educators about many environmental topics. The range of materials to be included in this directory will be extensive and includes a variety of approaches for education *about* the environment, education *in* the environment, and education *for* the environment.

Regarding the fourth objective, Learning Science under local context for cost reduction and minimum environmental degradation, this project is driven by the fact that students learn better if they can relate concepts to what they encounter in their day-to-day life. The local environment is rich in materials and activities where student can learn difficult science concepts without the traditional science laboratories, which are expensive to establish and run. Science laboratories also produce waste and by-products that are detrimental to the environment. The objective of using the local environment as a science laboratory is to reduce the cost of teaching science and to minimise environmental degradation by using the local Jua kali sector as an improved science laboratory (UNESCO, 1997).

Conclusions and recommendations

The present study was able to establish the extent to which the Masinde Muliro University of Science and Technology has mainstreamed sustainability concerns in its core business of teaching, research and community engagement. Overall, the performance of the university was average and the team therefore set out to develop a set of objectives and strategies to aid the achievement of MMUST Vision for the following ESD decade (2015-2025). Departments that engaged in community-related programmes tended to perform better in ESD than those that did not, with regard to indicators that relate to these engagements. This is because ESD pedagogy tends to promote integration of theory and practice. For the same reason, departments with highly applied programmes as well as significant community engagements tended to perform better than those offering the basic sciences.

Sustainability performance regarding the indicator clusters for curriculum, research and examinations was average and needs improving. This raises issues concerning the links between teaching approach and curriculum content, as one would expect high performance in teaching approach to be linked to high performance in curriculum content and assessment practice for purposes of a holistic ESD approach. Generally, the university has substantial expertise in sustainability matters, and this, together with its willingness to engage in sustainability teaching and research, should be made use of. These were found to be positive indicators in the university and showed the potential for agency in improving curriculum, assessment, and community engagement activities.

From the results of the present study, it is recommended that the university engages in fundraising and other collaborative activities in order to build the capacity of its staff with regard to sustainability teaching and research, and to fund community engagement and research activities. This could be done in collaboration with ESD partners within the UNU RCE structure involving potential partners, such as SIDA, UNEP, UNESCO, the NEMA, various non-governmental organisations (NGOs), private companies and organisations,

and other stakeholders, as was discussed in the follow-up workshop at MMUST where the sustainability audit results were discussed amongst participating units and faculties. It is also recommended that the university engages in regular sensitisation activities relating to sustainability, such as ESD workshops, and in regular audits to continuously mainstream sustainability into university engagements. Student involvement was not audited in this sustainability assessment, but also provides a potentially important area for strengthening university-based agency for sustainable development.

Acknowledgements

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Chapter 14: Integrating Sustainable Development In Higher Education In Morocco

Fatima Zahra Touzani

(Cadi Ayad University of Marrakech, Morocco)

Abstract

Overcrowding, the high rate of drop-outs, Arabisation, bilingualism and the lack of resources have noticeably shaken the Moroccan universities. Managers, teachers, students, stakeholders, and employers confirm this disturbance (Kohstall, 2012). The lack of satisfaction explains Morocco's decision to launch the new reform to face the numerous challenges that have contributed to this crisis (Chiheb, 2014). In spite of this remarkable step, things have not improved since both national and international reports still confirm that the Moroccan university is lagging far behind the rest of the developed ones. Accordingly, innovative ideas and approaches should be at the centre of any change. Sustainable development is one of these approaches that have to be taken into consideration while dealing with higher education in Morocco. Integrating sustainable development in Moroccan higher education is therefore no longer a choice, but a must. This chapter sheds light on the endeavours undertaken to integrate sustainable development in higher education through an institutional team's Change Project carried out in the Department of English in the Faculty of Letters and Human Sciences of Cadi Ayad University of Marrakech. The chapter provides a general context and a rationale of the Change Project. It also casts light on the project's objectives, implementation, outcomes and the various challenges that faced the implementation of ESD.

Introduction

One of the major factors that have rendered the Moroccan university under attack is the massive development of economy and technology. The general opinion is that a university degree no longer ensures finding a decent job (Schemm, 2013). Moroccan employers are no longer satisfied with the educated staff they hire as they used to in the past (Chiheb, 2014). This lack of satisfaction from both sides of the job market, the lack of effective communication among academics, the cultural vagueness that characterises some courses, the huge gap between the theoretical and practical components of courses, and the lack or misuse of updated communication tools stand behind the courageous decision of the new reform in higher education in Morocco (Chiheb, 2014). In 2002, the Ministry of Higher Education decided to adopt the European LMD model (Licence-Master-Doctorate).

It is against this background of the national educational reform that a Change Project was developed and proposed in the Faculty of Letters and Human Sciences in Cadi Ayad University, Marrakech.

Context of the project

In this section, I provide a general background that casts light on both the national and institutional contexts of the Change Project.

National context

The start of the new millennium has witnessed tremendous efforts that paved the way for major transformations in Morocco. Both the State and civil society (i.e. NGOs) have taken part through actions that have contributed to the sustainability movement. The most important action undertaken by the State is the National Initiative for Human Development (INDH), which responds to the UN Millennium Declaration that called for a new global partnership to reduce extreme poverty. Morocco expressed its willingness to take part in the project in order to achieve the Millennium Development Goals (MDGs). These goals range from reducing hunger, poverty, and child mortality, to combatting fatal diseases such as AIDS and malaria, and improving primary education, gender equality, maternal health and environmental sustainability in order to develop a *global* partnership for development.

Therefore, in 2005, coinciding with the start of the United Nations Decade of Education for Sustainable Development (DESD 2005-2014), the Moroccan State expressed its willingness to work on the issue of human development by establishing the INDH as one of the most important institutions devoted to sustainability. The cornerstone of this project is sustainable development through the encouragement of income-generating activities, responding to the basic needs of citizens in difficult situations and the needs of the poor in rural communities.

Another important initiative by the Moroccan government is the Green Morocco Plan, which is a recent agricultural strategy established by the Ministry of Agriculture and Fishing to promote the development of both the agricultural and territorial potential, especially since this fundamental sector constitutes 19% of the national gross domestic product (GDP).

Besides these two initiatives, other projects have seen the light in various regions in the country. One of these is the Moroccan Solar Energy project, particularly the Ouarzazate Concentrated Solar Power project, which is co-financed by the World Bank. Apart from its economic impact, this project is strongly driven by environmental concerns as it looks for green growth.

Similar environment oriented projects have been carried out in different parts of the country, such as:

- Water energy projects. The growing demand for energy in Morocco, especially electric power, pushed the Ministry of Energy, Mines, Water and Environment to continue the construction of dams. For example, six dams were constructed in 2005, namely My Hassan Bel Mehdi (Tetouan), Sidi Mhamed Ben Slimane El Jazouli (Tamanar), Tamesna (Ben Ahmed), Reg Aouin Kora (Tilmzoun), Kheng Messaoud (Tilmzoun), and Hassar (Ben Yekhlef).
- Recycling water projects. Relying on water-recycling technology, waste water is now put back to use in different regions that lack potable water, places such as Fes, Tamnsourt (Marrakech) and Kenitra.
- Wind power projects. Developing wind energy has recently become one of the main concerns of the State and they have established various wind farms such as those in Tetouan, Essaouira and Tarfaya.
- Plant preservation. The State has undertaken actions to preserve plant life, including palm trees (Marrakech and Fegig), Argan trees (Sous region), and saffron plantations (Taliwine region).

Institutional context

The Change Project was proposed by an institutional team from Cadi Ayad University, Faculty of Letters and Human Sciences, Department of English. Cadi Ayad University is composed of thirteen faculties (or colleges), namely the Faculty of Letters and Human Sciences (Marrakech), Faculty of Sciences Semlalia (Marrakech), Faculty of Sciences and Techniques (Marrakech), Faculty of Law, Economic and Social Sciences (Marrakech), Ecole Nationale de Commerce et de Gestion (Marrakech), Polydisciplinary Faculty (Safi), Faculty of Medicine and Pharmacy (Marrakech), Ecole Normale Supérieure (Marrakech), Ecole Nationale des Sciences Appliquées (Marrakech), Ecole Nationale des Sciences Appliquées (Safi), Ecole Supérieure de

Technologies (Safi), Ecole Supérieure de Technologies (Essaouira), and Centre Universitaire (Kelaa des Sraghna).

Various faculties and schools of the university were already involved in sustainability-oriented strategies, such as the organisation of workshops, study days, and conferences that aim to raise sustainability awareness. Yet, there were no sustainable development based courses in the Department of English before the Change Project started.

Rationale of the project

This Change Project revolves around integrating sustainable development within the English Department curriculum. This choice is motivated by the fact that the students registered in the Department of English have almost no idea about the issue for two reasons. First, they were not introduced to sustainable development in senior high school. Second, the Department of English does not offer courses that deal with sustainable development. The courses it offers concern English language, literature, and linguistics. Whereas the students registered in the Department of Geography, for instance, receive more opportunities to get introduced to sustainable development due to the nature of the courses, which deal with topics such as climate change, ecology and water shortage. Thus, this project functions as a bridge between the curriculum and the environment.

Objectives of the project

The major objective of the Change Project is to innovate curriculum and research orientation and contents within the Department of English by integrating sustainable development concepts within the already existing courses and research structures. Specifically, the project is based on:

- curriculum change;
- research change; and
- *Green Campus Management* action

In addition, the project intends to involve departments from other faculties / colleges, such as the Faculty of Sciences, to get students involved in sustainable development debates and actions.

Implementation of the Change Project

As mentioned, the Change Project is divided into three parts. Each part tries to introduce sustainable development to the students of the English Department by tackling a part of their academic studies.

Curriculum change

The only change we could bring to the curriculum of the English Department was partial and individual. We could not change courses and propose sustainable development ones for the simple reason that the only institution that can interfere in such a way is the Ministry of Higher Education. The changes we did make depended on individual lecturers in the sense that we had no authority to oblige other professors in the English Department to follow suit since professors have ultimate freedom to choose the texts they think suitable for their students. Accordingly, our team –Professor Fatima Bouabdelli and myself– tried to introduce our students to ESD hoping to involve other professors in the future.

In light of this situation, each of us included chapters that deal with sustainable development in our classes. Thus, in the autumn term Professor Bouabdelli included a sustainable development chapter in her *Introduction to Moroccan Culture* class (semester 3) that discusses the role of the Moroccan government and civil society in raising sustainability awareness, and I included a chapter in my *Introduction to Humanities* class (semester

1) that introduces students to sustainability as a concept and thought. In my *World Literature* class (semester 1), I included short stories and poems from different parts of the world that deal with sustainable development issues, such as water shortage and climate change.

In the spring term, Professor Bouabdelli added a chapter to her *General Communication* class (semester 4). The chapter deals with the role of communication in raising consciousness about sustainable development regardless of the culture of the target group. She also devoted two sessions to sustainable development in her *Literature and Contemporary Debates* class (semester 6) by including texts about debates on sustainable development issues. Thus, her students were able to take part in the discussion that paved the way for them to continue the debate outside the classroom. Similarly, in my *Culture and Society in the USA in a Globalized World* class (semester 2), I was able to introduce my students to the sustainable development policies in the USA through the analysis of a set of articles on the topic.

Despite being unable to introduce all the students of the English Department to sustainable development and its importance in higher education, we were at least able to raise the awareness of an interesting target group. We believe the lectures we gave and the different texts our students studied in class contributed, to a great extent, to raising their awareness about sustainable development issues.

Research change

As far as research is concerned, we proposed seminars on topics about sustainable development. At the beginning of the sixth semester, each professor in the Department of English gives seminars on a different topic. In semester six, students can choose the seminars they prefer and write a research paper on the proposed topics. This research paper (culminating project) is to be submitted to the English Department at the end of the sixth semester in partial fulfilment of the requirement for the degree of Bachelor of Arts. Accordingly, in addition to the seminars we included research topics on sustainable development in Morocco. Some students chose those topics as they found them more promising than the traditional ones. Thus, we supervised a number of papers that ranged from sustainable development as a concept to sustainable development as an everyday practice in Moroccan society. Those students showed great interest and perseverance towards achieving their goals by writing high quality papers.

Green Campus Management action

Alongside the change we tried to bring to the curriculum and research seminars of the Department of English, we tried to act on a different level through what we called a *Green Campus Management action*. This part of the project was meant to take green spaces into consideration. In partnership with the Department of English and the *Shore to Shore* British project, the *Anglo-Moroccan Shakespeare Garden* was founded in the Faculty of Letters and Human Sciences[19]. The garden was inaugurated one week after the last workshop our team organised in the faculty to conclude the ITP (March 2014). The *Anglo-Moroccan Shakespeare Garden* follows the Shakespearean garden model, which is associated with universities and festivals that are related to Shakespeare. As part of the Moroccan British cultural exchange project, this garden makes use of an Islamic garden design and plants from the Shakespearean era. Thus, it stands as a symbol of the Moroccan British cultural interaction.

In addition, in partnership with the Department of English and the *Shore to Shore* project, we founded a gardening club in the Faculty of Letters. The club has been able to bring together many students from various departments of the faculty. The main activity of the club is to take care of green spaces. The students involved have so far participated in several actions that have turned a few sites to beautiful green spaces.

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[19] The Shore to Shore project brings together young people from both countries to share ideas and culture. See for more information http://www.reepinfo.org/reep-in-morocco/.

Results of the Change Project

Our Change Project resulted in a number of good things, which are summarised below.

- Raising awareness of the students registered in the Department of English about sustainable development.
- Helping students to get involved in sustainable development debates and actions.
- Preparing sustainable development-oriented graduates, especially those who wrote their final term papers on a sustainable development topic.
- Building up a team of professors and experts who expressed their willingness to join the project. Especially the professors who participated in the two workshops we organised in the faculty as part of phase 3 and phase 5 of the ITP.
- Improving sustainability efforts in the Faculty of Letters and Human Sciences.

The results mentioned above were so positive and promising that we decided to continue our efforts to develop the project and involve new stakeholders. Thus, we decided to found a sustainable development centre in the Faculty of Letters and Human Sciences. Many professors have joined this project and we are currently working on administrative issues to start the centre.

Challenges and constraints of the Change Project

Though the Change Project was successful from our perspective, we faced some challenges during the implementation of ESD. Especially at the beginning, since the project was the first sustainable development-oriented initiative in the Department of English. The major challenges we faced are described below.

- Planning a sustainable development chapter was a time-consuming activity at the beginning of the project due to the lack of references.
- The lack of references obliged us to rely on articles written either in Arabic or in French, which needed more time.
- The lack of references in English also decreased the number of students who chose sustainable development topics for their final research papers.
- Dealing with sustainability-illiterate students was not encouraging at the beginning, because we had to start from scratch.

Conclusion

Our Change Project was based on curriculum change, research change, and campus management change. Each part of the project tried to introduce sustainable development to the students of the English Department. This was a step towards integrating ESD into the Department of English at the Cadi Ayad University. Developing countries, especially in Africa, have no other choice but to catch the train of development. Thus, we believe that the Change Project undertaken in the Faculty of Letters and Human Sciences in Marrakech is a great step that needs to be followed-up by involving other professors and stakeholders who are willing to take part in future projects.

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Part D: Faculty and Curriculum innovations

Chapter 15: Sustainability Issues In The Geography Curriculum For An Undergraduate Programme: The Case Of Addis Ababa University, Ethiopia

Aklilu Dalelo

(Addis Ababa University, Ethiopia)

Abstract

The Lucerne Declaration on Geographical Education for Sustainable Development proposes that the 'paradigm of sustainable development' be integrated into the teaching of geography at all levels and in all regions of the world. This study is aimed at assessing the extent to and ways in which sustainability issues have been addressed in the revised undergraduate curriculum for Geography at Addis Ababa University, Ethiopia. The study also attempts to critically examine the methods of delivery suggested in the curriculum. Content analysis has been used as a principal technique. Twenty (sustainability) issues have been identified for analysis from the first and second sections of the United Nations Agenda 21. Courses offered in the Department have been put under four categories: physical/ environmental; social/economic; interdisciplinary/ integrative and foundational/skills. Attempt is then made to show the extent to which sustainability issues have been integrated into the first three categories of courses. Results indicate that the three pillars or building blocs of sustainable development are duly represented in the curriculum, with more courses dealing with social/economic issues. Moreover, a noticeable attempt has been made to take an integrative approach. It is, however, clearly evident that classroom-based approaches occupy proportionally more space and remain the dominant modes of delivery across the course categories.

Introduction

The UN Decade of Education for Sustainable Development (UNDESD) proposes that "all levels of the education and training system need to be re-oriented towards a more sustainable model of development that meets the needs of the present generation, without compromising or jeopardizing the capacity of future generations to meet their needs" (UNEP, 2008, p. 9). Higher education institutions (HEIs) are often considered as crucial for the creation, transfer and application of knowledge as well as for the training and re-training of highly qualified professionals and managerial staff (Shihab-Eldin, 1998). One of the major aims of sustainability education at this level is to help prospective graduates to not only develop a broad conceptual framework but also to gain specialised knowledge and technical skills which could, in turn, be applied in natural resource management and environmental protection (Belal & Springuel, 1998).

Tertiary level academic institutions vary in the way they approach sustainability (Beringer & Adomssent, 2008; Togo & Lotz-Sisitka, 2008). Some concentrate on minimising their ecological impact through emphasising operational practices; while others focus on sustainability in the curriculum and take up the question of sustainability into their teaching, research and community service activities (Togo & Lotz-Sisitka, 2008). Beringer and Adomssent (2008) indicate three different types of projects related to sustainability in higher education. The first are what they call *traditional*, *first generation* greening the campus initiatives (including campaigns and initiatives that seek to change one or a limited number of operational or academic aspects). On the other end of *sustainability in higher education* spectrum are the sustainable university research and

development projects. These are scientific projects, usually externally funded and targeting the entire institution. In between the two are those greening the campus projects that work primarily on the practical domain but target the entire institution. Such projects work on the level of systematic change and have a theoretical-conceptual framework or underpinning (Beringer and Adomssent, 2008).

A strategy of education for sustainable development in sub-Saharan Africa was developed in 2006 (UNESCO, 2006a). This strategy encourages states to adopt policies and practices to ensure the mainstreaming of education for sustainable development (ESD) in education. It has been noted, on the other hand, that mainstreaming ESD requires developing, revising and adapting curriculum and learning support materials (Lotz-Sisitka, 2006). The *strengths model* appears to offer a useful conceptual entry point for possible development and revision of curricula to address sustainability issues.

The Strengths Model

"No one discipline can or should claim ownership of ESD." (UNESCO, 2006b, p. 27)

The strengths model is based on the recognition that many topics inherent in ESD are already part of the formal education curriculum though these topics may not be identified or seen to contribute to the larger concept of sustainability (UNESCO, 2006b; Cough & Scott, 2007). The model "respects existing disciplines but alters the detail of what is taught within them to have a particular focus" (Cough & Scott, 2007, p. 44). What is more, each discipline is believed to have associated pedagogical techniques. The combined pedagogical techniques and strategies of each discipline could, in turn, contribute to an expanded vision of how to teach for creativity, critical thinking, and a desire for lifelong learning.

The strengths model assumes that every discipline and every teacher can make an indispensable contribution to sustainability education. An empirical study conducted in South Africa seems to support this assumption to a certain extent (Togo, 2008). It was found that each of the three surveyed departments accommodates sustainable development issues "as far as they interrelate with the core purpose and orientation of their discipline" (Togo, 2008, p. 160). What are the strengths of Geography as a discipline? How do geographers approach sustainability? The next section of the paper explores these issues.

Geography and Sustainable Development

Bridging the social and natural sciences

Geographers study how the geosphere provides resources and living space for society and how society exerts an impact on the system "earth" (Haubrich, 2007, p. 28). In this way, geographers build a bridge between the natural and human sciences and seek to understand the whole "human-earth" system. A potential strength of this disciplinary culture is, according to Wallace (2002, p. 100), that geographers "should be better equipped than many other academics to treat complexity and difference seriously, and to appreciate the value of questions about things which interest them that come from 'outside the box' of their own particular theoretical framework". More specifically, a geographical education is expected to promote sustainable development by:

> "providing students with basic knowledge of the ecological, economic, social and cultural dimensions of sustainable development; skills and methods for evaluating and analyzing changes in natural, built and social environments; an understanding of sustainable ways of living and of environmentally friendly and ecologically effective production; the skill and willingness to work for sustainable development in their everyday lives; the skill to participate in the planning of their own environment; the capacity to develop the aesthetic response to the environment; and the ability to

act with conviction in questions affecting the surrounding world and to adopt the role of world citizens working on behalf of sustainable development and for better future at local, regional and international levels" (Houtsonen, 2004, p. 147).

A role beyond bridging

Geographers are also aware that their role goes far beyond conceptually linking the social and natural sciences. Wilbanks (1994, p. 553) argues that geographers should "advocate the principles of economic fairness and nature-society balance" through their roles as teachers and as citizens. Wilbanks also calls for going an extra mile to do extraordinarily well:

> In addition to integrating knowledge in order to meet pressing social needs and helping to unify our various traditions as a discipline, sustainable development focuses our attention on a great problem of mutual concern that can help to integrate the various pieces of our individual professional lives - to integrate them in the interest of a problem that we care enough about to go that extra mile to do extraordinarily well, not only in our scholarship but in every aspect of the ways that we live as experts in something the world needs very badly (Wilbanks, 1994, p. 553).

Despite wide ranging recognition of Geography's position as an "ideal discipline for the academic advancement and promulgation of the concept of sustainable development", there is still a sense that geographers have missed the opportunity to be at the forefront of research and teaching on sustainable development (McManus, 2004, p. 218). In fact, the environmental studies units that emerged in Australian universities in the 1970s were believed to have been established in order to "fill a vacuum which emerged as Geography neglected society-environment relationships and applied studies to pursue more narrowly specialized research and teaching" (Harvey, Forster & Bourman, 2002, p. 30).

The brief review on the role of Geography thus reveals two things. First, Geography, given its integrative tradition, can play an important role in addressing sustainability issues. Second, Geography may fail to use the opportunity by excessively focusing on the multiple sub-divisions (e.g. bio-, cultural-, economic-, human-, medical-, physical-, social-, urban-, etc.) that equally characterise the discipline. It seems, therefore, exciting to investigate whether and how Geography curricula are responding to the growing call for academic disciples to demonstrate their 'strengths' with regard to addressing sustainability issues. This paper focuses mainly on the degree to and ways of integration of 'sustainability issues' as defined in Agenda 21, the UN's action plan on sustainable development.

Objectives

In Ethiopia formal discussions to mainstream environment and sustainability into universities started in May 2010 and were linked to the United Nations Environment Ptrogramme (UNEP) Mainstreaming Environment and Sustainability in African Universities Programme (Eshetu, 2010). Does this imply that not much has been done, prior to this initiative, to address concerns about environment and sustainability? This paper tries to answer this question by analysing the degree to and ways in which sustainability issues have been addressed in Geography curriculum for undergraduate programme at Addis Ababa University. The chapter also attempts to critically examine the methods of teaching suggested in the curriculum.

Methodology

ESD focuses largely on the major social, economic and environmental issues that threaten the sustainability of our planet. Many of these key issues were identified at the 1992 Earth Summit in Rio de Janeiro and outlined in Agenda 21 (UNESCO, 2006b). Agenda 21 is a document with 40 chapters grouped under four broad sections: (1) social and economic dimensions; (2) conservation and management of resources; (3) strengthening the role of major groups; and (4) means of implementation. It has been argued that understanding and addressing the issues identified in Agenda 21 lie at the heart of education for sustainability (UNESCO, 2006b). In line with this, the present study selected 20 issues, which are more likely to be

addressed in Geography curricula, for analysis from the first and second sections of Agenda 21 (see Table 1).

Table 1: Key issues addressed in Agenda 21 and identified for analysis

Section/ chapter	Issues/themes	Section/ chapter	Issues/themes
1/3	Combating poverty[20]	11/13	Sustainable mountain development
1/4	Changing consumption patterns	11/14	Sustainable agriculture and rural development
1/5	Demographic dynamics and sustainability	11/15	Conservation of biological diversity
1/6	Protecting and promoting human health	11/16	Management of biotechnology
1/7	Promoting sustainable human settlement development	11/17	Protection of the oceans, all kinds of seas and coastal areas
1/8	Integrating environment and development in decision-making	11/18	Protection of the quality and supply of freshwater resources
II/9	Protection of the atmosphere	11/19	Management of toxic chemicals
11/10	Planning and management of land resources	11/20	Management of hazardous wastes
11/11	Combating deforestation	11/21	Management of solid wastes and sewage
11/12	Combating desertification and drought	11/22	Management of radioactive wastes

Source: United Nations, 1992

As indicated earlier, the major aim of this study was understanding the extent to and ways in which sustainability issues have been addressed in Geography curriculum at undergraduate level. To this end, content analysis has been used as a principal technique. Content analysis is defined as "a research technique for objective, systematic and quantitative description of the manifest content of communication" (Berelson, 1952, quoted in Asgedom, 1998, p. 18). Leedy and Ormord (2005) and Neuendorf (2002) presented the technique as "a careful, detailed, systematic examination and interpretation of a particular body of material in an effort to identify patterns, themes, biases, and meanings" (Neuendorf, 2002, quoted in Berg, 2007, p. 303-304). The technique is often accomplished through the use of objective language, categorisation, and systematic surveys (Burns-Bammel et al., 1988, quoted in Norris & Jacobson, 1998, p. 39).

The recently revised Geography curriculum for undergraduate programme at Addis Ababa University has been analysed based on the following steps:

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[20] The highlighted words or phrases represent the whole theme in the analysis of results and discussions thereof in the paper.

Step one: Determining analytical categories

The major area/core courses (excluding general education courses) offered in the Department have been divided into four categories: physical / environmental geography; social/economic geography; interdisciplinary / integrative courses; and foundational / skill courses. The first three categories have been considered in this paper for analysis. The fourth category is not expected to address any specific issue like the one investigated in this paper.

Step two: Establishing units of analysis

The specific courses related to the first three categories, indicated in step one, have been used as units of analysis.The courses in the three categories account for 67.4% of the core courses; and 56.9% of the total course requirement for graduation.

Step three: Determining criteria for sorting data into analytic categories

The criteria used here is having sustainability issues clearly (manifestly) mentioned in the statements of objectives and/or corresponding course descriptions. Twenty such issues likely to be addressed in Geography curricula have been identified (see Table 1).

Step four: Counting the number of entries in each of the three categories

This has been undertaken by counting cases (specific courses with objectives and/or contents related to sustainability issues).

Findings

Programme background, objectives and graduates' profile

The undergraduate programme of the Department of Geography has a history that goes back to the beginning of tertiary education in Ethiopia. The teaching of Geography started in 1950 at the University College of Addis Ababa, the only tertiary-level institution in the country at the time. Initially, Geography was offered as a field of study to Arts students. Since 1958, the Department has been offering courses at the undergraduate level leading to the Bachelor of Arts Degree in Geography.

A major revision of the curriculum took place at the beginning of 2000, which led, among others, to a change in the name of the department from *Department of Geography* to *Department of Geography and Environmental Studies* (DeGEES). Other aspects of the change include strengthening of geographic tools and techniques and putting greater emphasis on environment and land use in response to the emerging realities and corresponding challenges at global, country and disciplinary levels. One can thus note here that the department has given due attention to recent developments at global and national levels and responded to them by making major revisions to its curriculum. According to this revised curriculum, the objectives of the undergraduate programme are to produce professionals who are able to:

1. distinguish facts about and patterns of spatio-temporal processes underlying the human and physical phenomena and their interactions;
2. identify and explain spatio-temporal problems of the physical and human environment;
3. distinguish the risks, potentials, and prospects of Ethiopia's environment in isolation as well as in global perspective;
4. generate, analyse, and present spatio-temporal data of the physical and human environment using different scientific procedures, models, tools, and techniques;

5. demonstrate confidence and conviction that enable them to become positive role models to society, committed to change and development;
6. participate in community development: provide professional trainings; mobilise the public for positive actions; and provide professional consultancy services with a view to accelerate environmental, social and economic development; and
7. conduct research in different areas (environment, development, society, economy, etcetera) that would help in solving societies' problems and disseminate results thereof (DeGEES, 2008).

The revised curriculum also outlines the graduates'profile (DeGEES, 2008). Accordingly, the graduates of the department are expected to:

1. demonstrate knowledge and understanding of spatio-temporal distribution of both the physical and human phenomena; and use geographic and environmental perspectives to evaluate issues, processes and events;
2. identify, collect and compile information through household and field surveys, aerial photographs and remotely sensed satellite images so as to alleviate spatio-temporal problems of physical and human environment;
3. demonstrate ethical values, and set a leadership role model in national, regional and local development;
4. work cooperatively for the common good of society;
5. initiate and participate actively in community services and developmental activities;
6. apply modern tools and techniques like Geographic Information System (GIS) and Remote Sensing (RS) in managing resources and protecting environment for sustainable development;
7. develop her/himself through continuous acquisition of knowledge and experience; and to be able to survive in a dynamic environment and rapidly evolving society;
8. conduct research beneficial to society and present results in clear and coherent manner; and
9. demonstrate basic understanding about fundamental national issues and sustainable development.

McManus (2004, p. 229) suggests that sustainable development is "a challenge to higher education and, possibly, to geography more so than many other disciplines". The list of objectives and the graduates' profile shown above clearly indicate that the Department of Geography and Environmental Studies at Addis Ababa University takes sustainability issues seriously. All the key components of sustainability education (environmental protection, social justice and economic growth) seem to be duly recognised. Moreover, desired characteristics of sustainability education like change in a value system; aspiring to be role model; active participation in community mobilisation and development endeavours; preparing to manage changes and uncertainties in society and the physical environment; capacity to work cooperatively have been clearly articulated in the graduates' profile. One can thus see that the programme objectives and graduates' profile, as they stand in the revised curriculum, have the potential to guide both the selection of appropriate content for sustainability education and approaches thereof.

Programme content

As indicated earlier, the department needed to revise its curriculum in order to address some of the shortcomings both in content and modes of delivery. The revision had two aspects: new courses were added and the content of some of the existing courses were modified in such a way that they properly address current economic, social, cultural and environmental problems (DeGEES, 2008). The changes affected all four categories of courses (see Methodology). Accordingly, seven courses (20 credits) were newly added and five courses (15 credits) modified. This paper attempts to relate all the core courses offered by the department to the so-called three pillars or building blocks of sustainable development (see Table 2).

Table 2: Major areas/core courses offered in the Department by category

Category[21]	Course title	Credit hours	Status	Methods of teaching suggested
CI/1	Biogeography	**3**	Old	Not indicated
CI/2	Geomorphology	**3**	Modified	Lecture, illustrations (slides, diagrams, photographs) and fieldtrip
CI/3	Fundamentals of Climatology	**3**	Modified	Lecture, discussion, and field visit
CI/4	Applied Climatology	**3**	Modified	Lecture and field trip
CI/5	Environmental Hydrology	**3**	New	Lecture and field visit
CI/6	Soil Geography	**3**	Old	Lecture, discussion, field visits, and laboratory work
	Total	**18**		
	Percentage	**19.6**		
CII/1	Introduction to Economic Geography	**3**	Old	Lecture, audio-visual resources, and discussion
CII/2	Social and Cultural Geography	**3**	Old	Lecture, audio-visual resources, student presentations and discussion
CII/3	Geography of Population and Settlement	**3**	Old	Lecture, student presentations and discussion

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[21] CI: Physical/environmental Geography; CII: Social/economic Geography; CIII: interdisciplinary/ integrative courses

CII/4	The Geography of Transport and Development	3	Old	Lecture, student presentations and discussion
CII/5	Urban Geography	3	Old	Not indicated
CII/6	Gender Geography	2	New	Lecture, student presentations, dialogue and discussions
CII/7	Livelihood and Food Security	3	New	Lecture and student presentations
CII/8	Political Geography	3	Old	Lecture
CII/9	Economic Geography of Ethiopia	3	Old	Lecture, student presentations and discussions
CII/10	Urban and Regional Services Planning	3	New	Not indicated
	Total	**29**		
	Percentage	**31.5**		
CIII/1	Fundamentals of Regional Planning	3	Modified	Lecture, student presentations, discussion, guest lectures, and field visits
cm/2	Seminar on Africa and the Middle East	3	Modified	Lecture, student presentations
cm/3	Agro-ecology and Farming System	3	Old	Lecture, student presentations and field visit
cm/4	Global Environmental Issues	3	New	Lecture and seminars
cm/5	Terrain Analysis and Land Use Planning	3	Old	Lecture, practical laboratory work and field trip
	Total	**15**		
	Percentage	**16.3**		

Physical / Environmental Geography

Inkpen (2009, p. 378) argues that "physical geographers have made substantial contributions to sustainable development by providing understanding about the nature of the physical environment and how it changes". The curriculum analysis shows that six courses (19.6% of the core courses) fall under the category

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'physical/environmental' Geography. One can see from the list of the courses that the essential components of the bio-physical environment are all included (Table 2). It is also important to note that most of the courses in this category have been modified during the revision, with only two retained from the old curriculum. A course entitled 'Environmental Hydrology' is newly introduced.

Social / Economic Geography

Ten courses (accounting for 31.5% of the core courses) fall under social/economic Geography (Table 2). The list of issues treated in this category is quite diverse. Society, culture and economy; population and settlement; transport and development; urbanisation; gender; livelihood and food security; politics; and regional planning are all addressed. Three of the ten courses - namely, *Gender Geography*; *Livelihood and Food Security*; and *Urban and Regional Services Planning* - are newly introduced following the curriculum revision. This group of courses is intended to create a comprehensive understanding of the social and political roots of sustainability issues and concerns.

Interdisciplinary / integrative courses

Geography often aspires to have an integrative understanding of the earth "as the home of humanity" (Wallace, 2002, p. 101). It is further suggested that such a perspective gives the discipline a unique opportunity to "respond knowledgeably to some of the most pressing issues confronting individuals and societies in our time" (Wallace, 2002, p. 101). Table 3 indicates that five courses fall under the third category. The courses in this category are aimed at integrating issues of the bio-physical and socio-cultural environments, and, hence, most appropriate to address sustainability as it requires an integrated approach to understand complex problems. For instance, one of the courses in this category, *Global Environmental Issues*, could be readily used to initiate and conduct discussions on any issue at a global level. It is also important to note here that this particular course is a result of the recent curriculum revision (Table 2).

Foundational / skill category

Wilbanks (1994, p. 549) argues that in this age of "information superhighways" our skill in GIS - emphasising connections with subject-matter knowledge - will be part of our contribution to the art and science of sustainable development. McKeown-Ice (1994, p. 42) also suggests that "Cartography and map interpretation offer a strong analytic component to environmental education". In view of these arguments, the revised Geography curriculum could earn more than a satisfactory 'grade' for incorporation of courses related to geographic skills. Nearly one third of the courses (32.6%) fall under the foundational / skill category. The courses cover skills in areas ranging from map reading to digital image processing and interpretation. As indicated in the methodology section, courses in this category are not expected to be linked with any specific aspect of sustainability. However, they can facilitate understanding and application of concepts directly related to sustainability. The fact that ten courses are allotted to this category indicates a clear tendency to focus more on skill development, perhaps to address the growing need for "vocationally focused degrees" (Holmes, 2002, p.16). Four of the ten courses are committed, for instance, to skills related to remote sensing and geographic information system.

Table 3: Integration of sustainability issues into different courses

Issues from Agenda 21		Category of courses				Specific courses
Section/ Chapter	Issue	CI*	CII*	cm*	Total	
I/3& 1/4	Poverty and consumption patterns	0	1	0	**1**	CII/7**
1/5,1/6 & 1/7	Demographic dynamics, human health and human settlement	0	5	0	**5**	CII/2, CII/3, CII/5, CII/6, CII/10
1/8	Integrating environment and development	0	1	2	**3**	CII/9, CIII/1, CIII/4
II/9	The atmosphere	2	0	0	**2**	CI/3, CI/4
II/10&II/14	Land resources, agriculture and rural development	1	0	2	**3**	CI/6, CIII/3, cm/5
II/11& 11/12	Deforestation, desertification and drought	0	0	1	**1**	CIII/4
11/13	Mountain development	0	0	0	**0**	
11/15	Biological diversity	1	0	0	**1**	CI/1
11/16	Biotechnology	0	0	0	**0**	
II/17&II/18	Freshwater, oceans, seas and coastal areas	1	0	0	**1**	CI/5
II/19&II/20	Toxic chemicals and hazardous wastes	0	0	0	**0**	
II/21& 11/22	Solid wastes and sewage; and radioactive wastes	0	1	0	**1**	CII/10
	Globalisation	0	4	1	**5**	CII/1, CII/2, CII/4, CII/8, cm/2
	Total	5	12	6		

CI* (Category I): Physical/environmental Geography CII* (Category II): Human/economic Geography CIII* (Category III): Interdisciplinary/integrative courses CII/7**: The course numbers are as given in Table 2.

Integration of sustainability issues

As noted earlier, this study tries to examine the extent to which sustainability issues have been integrated into the revised curriculum for undergraduate Geography programme. To this end, 20 issues have been identified for analysis from Agenda 21. Another issue, 'globalisation', has been added to this list (Table 3). Some of the

issues have been combined for the sake of brevity. Table 3 shows that 15 out of the 20 issues (75%) have been integrated to a larger or smaller extent. The five issues that have not been adequately addressed in the curriculum are mountain development, biotechnology, toxic chemicals, hazardous wastes, and radioactive wastes. Category I of the Geography courses, physical/environmental geography, addresses aspects of six of the 20 issues: the atmosphere; land resources, agriculture and rural development; biological diversity; freshwater, oceans, seas and coastal areas. The second category of Geography courses, social / economic Geography, addresses aspects of eight of the issues from Agenda 21 and globalisation. The issues addressed in Category II courses are: poverty and consumption patterns; demographic dynamics; human health and human settlement; integrating environment and development; and solid wastes and sewage. Courses under category III, interdisciplinary / integrative, address five issues from Agenda 21 and globalisation. The issues addressed in Category III are: integrating environment and development; land resources, agriculture and rural development; and deforestation, desertification and drought.

It is important to emphasise that all the courses in three of the categories, except a course entitled 'Geomorphology', address sustainability issues as defined in this study. Obviously, some courses address the issues more extensively than others. Comparatively, courses in Category II have addressed larger number of issues than courses in other categories (Table 3). Details as to the extent to and ways in which the courses addressed specific sustainability issues are presented in the next section.

Extent to and ways of integration

This section presents a detailed account of how sustainability issues have been addressed in the curriculum by examining each of the issues in turn following the order of their presentation in Agenda 21.

Poverty and consumption patterns

These two important issues have not been adequately addressed in the revised curriculum. They have not been dealt with clearly and directly. The only course that addresses issues closely related to poverty and patterns of consumption is *Livelihoods and Food Security.* The topics suggested for coverage in the course include vulnerability and food security; livelihood assets and strategies of poor households in developing countries; and intensity and patterns of food insecurity over space and time.

Demographic dynamics, human health and human settlement

These are issues that enjoy the highest coverage in the curriculum. There are a number of courses that address these issues both directly and indirectly. A course entitled *Geography of Population and Settlement* seems to be most directly related. The topics proposed to be covered in this course include factors related to spatial population distribution; theories related to population and population-resource relationships; fertility and mortality patterns and migration of population; impacts of population growth on development and environment; and population planning and types and patterns of settlement.

Issues related to human health and settlement are also touched on in a course entitled *Social and Cultural Geography*. The topics suggested for coverage in this course include changing human-environment relations; spatial inequalities in distribution and access to resources at local, regional and global levels; social planning and public policy; role of civil society in social welfare; role of culture in transformation of the earth; human settlements and spatial patterns of language and religion; cultural unities and diversities; and multiculturalism and globalisation. A course entitled *Urban Geography* also contains issues related directly to human settlement (and indirectly to human health). The topics suggested in this course include characteristics of urban settlements; contemporary world urbanisation patterns; the role of cities in national and regional economic development; urban land use patterns and the evolution of functional zones; the quality of urban life, urban labour-market structure, urban poverty and access to housing and urban services (with a focus on characteristics of urban places in developing countries).

A course entitled *Gender Geography* seems to have huge potential to address issues surrounding demographic dynamics in developing countries. As it stands, however, the course only skirts the issue. Topics suggested for coverage in this course include geographies of gender and the gendered nature of spatial

relations; feminism and feminist geography, relation of gender and geographical studies; gender as a structuring principle in all human activities; history of women (feminist) movement and academic feminism; relationship between gender and rurality; women and environment; differences in the lives of men and women over space; identity, power and sexuality.

Integrating environment and development
Courses in Category III generally take a more integrative approach to the issue of environment and development. For instance, the course entitled *Fundamentals of Regional Plarrning* addresses issues like the role of environmental and human resources in regional development; theories of regional development; and instruments of regional development policy. Another course in the same category, entitled Gl*obal Environmental Issues*, is one of the courses in the entire curriculum best suited to bring together issues from the bio-physical and socio-cultural environments (see details about this course under *Deforestation, desertification and drought*. Another course enabled *Economic Geography of Ethiopia* also attempts to show the link between use of environmental resources and economic development. Topics suggested for coverage in this course include population-environment interactions and the resource base of Ethiopia, among others.

The atmosphere
This is one of the issues in the physical environment which are thoroughly presented in the curriculum. Two courses entitled *Fundamentals of Climatology* and *Applied Climatology* address the issue. Topics suggested for coverage in the first course include composition and structure of the atmosphere; climatic elements; temperature; pressure; winds; atmospheric moisture; and climatic classification and types. The second course sets out to cover such issues as evaporation and evapotranspiration; water balance / budget; rainfall-coefficient and rainfall regimes; and methods of analysing the trends of temperature and rainfall as well as global climatic changes. It is interesting to see that global climate change has been specifically mentioned as one of the topics for discussion in *Applied Climatology*.

Land resources, agriculture and rural development
Three courses address these issues to a different degree. The course entitled *Soil Geography* focuses, for instance, on issues related to land and land resource management. Topics suggested include the physical, chemical and biological properties of soil; processes and factors of soil formation and development; principles and methods of soil classification; distribution of major soil groups with emphasis on Ethiopian soils; soil degradation and its forms; and conservation and management of soils. Another course entitled *Agro-ecology and Farming System* offers a more comprehensive basis for dealing with issues related to land resources, agriculture and rural development. Among the issues suggested to be covered are physical bases of agriculture; land degradation, pollution and its protection; agro-climatology and hydrology; climate and soil moisture regions; climatic requirements of crops and livestock; weather hazards; world water resource and water budget; crop and animal pests and diseases; cultural bases of agriculture; people as producers and consumers; crop and livestock domestication; the science and technology factor; the social and political factor; farming systems; and agriculture and environment.

The course entitled *Terrain Analysis and Land Use Planning* also has a huge potential to address issues related to land use and land resource management. As it stands, however, this course seems to be too technical with the following issues given more emphasis: terrain data types and sources; procuring, extracting and organisation of terrain data; analysis of attributes of terrain; terrain classification and terrain units; techniques of terrain representation; drawing cross-section; absolute and relative relief and dissection index; slope analysis and mapping; drainage system and pattern; drainage density and texture; drainage basin delineation and characteristics; terrain characteristics and their uses.

Deforestation, desertification and drought
The revised curriculum introduced an interdisciplinary course directly related to the issue of sustainability and sustainable development. This course, entitled *Global Environmental Issues* is aimed, among others, at exposing students to the different viewpoints on interaction between environment and development. Issues proposed for discussion include the greenhouse effect; ozone depletion and climate change; destruction of

habitats and biodiversity; freshwater shortage and land degradation; and the concept of environmentally sustainable development. Issues related to deforestation, desertification and drought are largely addressed in this course; and to a smaller extent in other courses analysed in this section of the paper.

Biological diversity
There is a course entitled *Biogeography* aimed at helping students to "appreciate the impact of man in changing his environment and his role in protection and conservation" (DeGEES, 2008, unpaged). Among the topics suggested for coverage are the evolution and distribution of life; structure and function of ecosystem; and the impact of people on the environment. One can thus note that the course offers ample opportunity to discuss the current trends (both local and global) in biodiversity use and abuse.

Freshwater, oceans, seas and coastal areas
One of the newly introduced courses, entitled *Environmental hydrology,* is aimed at enabling students to "understand the key processes of the hydrological cycle [...[and its interaction with the broad environmental system" (DeGEES, 2008, unpaged). The course emphasises freshwater flow on and near the ground surface. Among the topics intended for coverage are precipitation, evapotranspiration, infiltration and soil water processes; stream flow, groundwater formation and movement; and basic concepts in water resources management. This course could form the basis for a critical assessment of issues related to water resource use and management; and the problems related to current use of water bodies, wetlands and coastal areas.

Solid wastes and sewage
An interdisciplinary course entitled *Urban and Regional Services Planning* offers a huge opportunity to address issues related to provision of urban services including solid waste management and sewage treatment. One of the objectives of this course sets out, for instance, to provide students "with methods associated with planning for improved municipal service delivery and facilities such as transportation, drainage, sewerage, solid waste, educational and health facilities" (DeGEES, 2008, unpaged).

Globalisation
Globalisation is the only issue included in this study outside Agenda 21. It is strongly argued that "socio-economic growth and the sustainable exploitation of natural resources can at present only be properly understood by taking account of globalization" (De Haan, 2000, p. 363). The revised curriculum seems to put a marked emphasis on globalisation. A course entitled *Introduction to Economic Geography* offers, for instance, an immense opportunity to address the pros and cons of globalisation. Among the topics suggested for coverage in this course are global patterns of distribution of industrialisation; development of transportation; internationalisation of production and role of transnational corporations in industry, trade and information and communication technology. Aspects of globalisation have also been addressed in another course entitled *Social and Cultural Geography* (see details about this course under *Human heath and settlement*).

A course entitled *Geography of Transport and Development* tries to link development with transport and communication. The latter is further linked (though implicitly) to the process of globalisation. The other course with good opportunity for addressing globalisation is *Political Geography*. Topics suggested for coverage in this course include frontiers and boundaries; core areas and capital cities; global strategic views; water and islands; aspects of hydro-politics of the Nile River; imperialism, colonialism and decolonisation; contemporary international relations; and political geography and foreign policy. Finally, a course entitled *Seminar on Africa and the Middle East* creates a chance to discuss on factors that enhance and/or hinder the process of globalisation. The stated objectives of this course are creating awareness about the "impacts of the tri-continental location of the Middle East on the economic, political and social conditions of Africa" and help students to understand the "historical and contemporary relationships between the populations of Africa and the Middle East" (DeGEES, 2008, unpaged).

Delivery methods

Integration of sustainability issues is an important step but is not sufficient to achieve the goals of a sustainable future. Use of the appropriate modes of delivery is equally important. With regard to this, Eilam and Trop (2011) strongly suggest that academic learning, inter / multidisciplinary learning, multidimensional learning, and emotional learning are four essential principles of EE / ESD pedagogy The revised Geography curriculum assessed here suggests diverse methods of teaching for consideration by the respective course teachers / instructors. These include lecture, student presentation, discussion / dialogue, use of audio-visual resources, fieldwork, laboratory work and inviting guest speakers (Table 2). In three courses, no suggestion has been made as to methods of teaching. On the other hand, a pure lecture has been suggested in one case. In all other cases, 17 courses, a combination of two or more of the aforementioned methods has been suggested, the most frequently suggested combination being lecture, presentations and discussion' (Table 4).

Table 4: Delivery methods suggested in the curriculum

S/n	Method	Frequency	%
1	Lecture	1	4.76
2	Lecture, presentations and discussion (dialogue mentioned once)	7	33.33
3	Lecture, audio-visual resources, and discussion	1	4.76
4	Lecture, audio-visual resources, presentations and discussion	1	4.76
5	Lecture and field trip	2	9.52
6	Lecture, illustrations and fieldtrip	1	4.76
7	Lecture, presentation / discussion and field visit	2	9.52
8	Lecture, laboratory work and field trip	1	4.76
9	Lecture, discussion, laboratory work and field visits	1	4.76
10	Lecture, presentations, discussion, guest lectures and field visits	1	4.76
11	Not indicated	3	14.29
	Total	21	100.00

Given the traditional role of teacher dominated methodologies at universities in Ethiopia, it is not surprising that this method has been suggested for practically all the courses. On the contrary, fieldwork has been explicitly suggested only in eight of the 18 courses (44.4%) for which teaching methods are suggested. This shows that classroom-based approaches (55.6% of the courses are done this way) still dominate the teaching process despite the expressed wish of the Department to improve the mode of delivery. Such a dominance of "old pedagogies" is not unique to the department surveyed here as the observation by Eilam andTrop (2011) clearly indicates:

> For years, ESD scholars have been advocating to implement changes in pedagogies. Despite this call, while the curricula have been evolving and responding to the policy discourse, educators continue to implement old pedagogies in the service of new curricular contents (p. 56).

Summary and recommendation

Geography is often presented as an ideal discipline for the academic advancement and promulgation of the concept of sustainable development (McManus, 2004). The Lucerne Declaration on Geographical Education for Sustainable Development proposes that "the paradigm of sustainable development should be integrated into the teaching of geography at all levels and in all regions of the world" (Haubrich, Reinfried & Schleicher, 2007, p. 243). This paper tried to report the findings of a study aimed at assessing the place of sustainability issues in Geography curriculum for undergraduate programme at Addis Ababa University. Content analysis has been used as a principal method for data generation. The following points summarise the key findings of the study:

- The three pillars / building blocks of sustainable development are duly represented in the revised curriculum, with more courses dealing with social/economic issues. Besides, the curriculum has multiple rooms for further incorporation of issues and concerns, which are not adequately addressed in the existing courses. The diversity of topics covered in the courses attest to this fact.
- A remarkable attempt has been made to take an integrative approach. The Department designed a group of courses meant to integrate issues in the bio-physical and socioeconomic environments. In view of this, the Department seems to have placed itself in a position to lead and contribute to environmental and sustainability education in Ethiopia. This is all the more important given the current role of Addis Ababa University to train the teaching staff needed for the newly established universities throughout the country.
- Diverse methods of teaching have been suggested in the revised curriculum. It is, however, clearly evident that classroom-based approaches occupy proportionally more space and remain more dominant. This goes against Geography's traditional claim to be a field-based and practice-oriented discipline; and signals an area for continued professional learning and growth amongst academic staff.
- The revised curriculum offers no evidence for the application of methodologies intended to help students to acquire favourable values (e.g. values clarification and values analysis); and this appears to be another area for further professional learning and growth of academic staff.

The curriculum assessed in this study is an official and legally binding document containing all the requirements for graduation. The courses examined here are all mandatory, i.e. they will have to be attended by all students. However, the way each of the courses is actually treated and the effectiveness thereof depends on several factors, including the background and competence of the course teachers/instructors. There is therefore an urgent need for a follow-up study in order to assess the effectiveness of the revised curriculum in achieving its stated objectives and factors that affect its effectiveness. Such a study, if and when conducted, should pay special attention to the balance between the four essential principles of EE / ESD pedagogy: academic learning, inter/multidisciplinary learning, multidimensional learning, and emotional learning (Eilam & Trop, 2011); and should consider issues such as values and values education more carefully than this current study has been able to do.

Acknowledgements

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Chapter 16: Incorporating ESD Into The Secondary Teacher Education Curricula At Bahir Dar University, Ethiopia

Dereje Taye and Asrat Dereb

(Bahir Dar University, Ethiopia)

Abstract

The Ethiopian Ministry of Education clearly articulates the need for the integration of the issue of environment and sustainable development into the curricula at all levels of the education system. This move is backed by the country's plan of a Climate-Resilient Green Economy (CRGE) initiative to protect the country from the adverse effects of climate change and to build a green economy that will help realise its ambition of reaching middle-income status before 2025. This chapter describes how an ESD Change Project, supported by Sida's International Training Programmes, has been successfully implemented in a teacher education programme of the Educational and Behavioral Sciences Faculty of Bahir Dar University. The chapter illustrates the contextual factors that contribute to the successful implementation of the Change Project. Moreover, it highlights how important it is for higher officials in institutions, like universities, to be well aware of ESD related issues in order to minimise the challenges and constraints one could face in realising Change Projects.

Introduction

As one of the least developed countries with an insignificant contribution to the causes, Ethiopia is experiencing the effects of climate change. According to a 2013 report by Maplecroft (2014), Ethiopia is the tenth most vulnerable country to climate change effects. Despite this fact, the country is registering one of the fastest economic developments in Africa and it has a vision of becoming a middle-income country (MIC) by 2025. It also pledges to achieve a green, climate-resilient economy with zero net emissions by 2025. The country puts sustainable development as a leading principle in its short-term and long-term development strategies. Higher education institutions in Ethiopia should play a critical role in supporting the government pursuing its ambitious plan of becoming a middle-income country through its green economy strategy. They should also respond to the current demands of the society, such as sustainable development, through their historical missions of teaching, research and community service.

This chapter discusses the efforts being made to introduce Education for Sustainable Development (ESD) into the teacher education programme of Bahir Dar University through an ESD Change Project. The chapter begins with the discussion of national and institutional contexts related to ESD. This is followed by the presentation of a curriculum audit and its results on the institutional integration of ESD in the Bahir Dar University. The detailed processes that resulted in the development of ESD modules, an ESD student club together, and different experience sharing workshops and trainings are also discussed in the chapter. Finally, the outcomes and challenges of the project are briefly explained.

National context

Economic development policies and strategies

Currently, Ethiopia has one of the fastest non-oil growing economies in world (World Bank, 2014). The economy has been registering double digits GDP for the last ten years. The country has an agricultural led industrialisation policy. Ethiopia's vision in the economic sector is to build a modern and productive agricultural sector with enhanced technology, and an industrial sector that plays a leading role in the economy. The aim is to sustain economic development, secure social justice, and increase the per capita income of citizens, so that the country reaches the level of middle-income countries (MoFED, 2010).

Building on the positive development of recent years, the Ethiopian government intends to lift the country to middle-income status (with a GDP per capita of around 1,000 USD) within 15 years. The country is now implementing the first five-year Growth and Transformation Plan (GTP) (MoFED, 2010). The GTP is an ambitious development plan that aims at eradicating poverty and increasing youth employment through a sustainable development of the agriculture sector that would lead to export oriented industrialisation.

Concurrently, Ethiopian farmers are already suffering from the effect of climate change. A recent study on the impact of climate change on Ethiopia has revealed that irregularity and unpredictability in the rainfall patterns, temperature increase as well as heavy rains and frost are becoming common in most parts of the country (Tröger, 2011). In response to these trends, in 2011, the Government of the Federal Democratic Republic of Ethiopia has initiated a Climate-Resilient Green Economy (CRGE) initiative to protect the country from the adverse effects of climate change and to build a green economy that will help realise its ambition of reaching middle-income status by 2025 (FDRE, 2011).

The green economy initiative is embedded in Ethiopia's ambitious Growth and Transformation Plan (GTP). The GTP treats environment and climate change as one of the cross-cutting sectors in the development plan. In the GTP, it is stated that:

> Environmental conservation plays a vital role in sustainable development. Building a 'Green Economy' and ongoing implementation of environmental laws are among the key strategic directions to be pursued during the plan period (MoFED, 2011b, p. 119).

In this regard, building a carbon neutral and climate resilient economy and enforcement of existing environmental laws are precedence in connection to environmental conservation.

The education policy and strategies

The Ethiopian education and training policy, which is currently under implementation, aims to develop citizens who can take care of and utilise resources wisely, who care for the well-being of people, and who respect the democratic principles enshrined in the constitution. It has also a goal of relating education to environment and societal needs (MoE, 1994). Education is a key factor for improving the capacity of people to address the environment and development issues and advocating sustainable development (UNESCO, 2005). The introduction of this policy in 1994 can be seen as an indication that the government of Ethiopia has already capitalised on the role of education in ensuring sustainable development.

Accordingly, the Ethiopian Ministry of Education clearly articulated the need for the integration of the issue of sustainable development into the curricula at all levels of the education system. For instance, the National Curriculum Framework for K-12 states that the syllabi for K-12 should highlight issues relating to population and environment, such as the problems of rapid population growth, family planning, environmental degradation, conservation of resources and pollution (MoE, 2011). Similarly, the guiding education policy document, *The Education Sector Development Program (ESDP) IV, 2010/2011-2014/2015*, has identified Environmental Education and Protection as one of the main issues to be addressed in the education sector

(MoE, 2010). In the ESDP policy document, it is clearly stated that teachers should get training on Environmental Education and Protection at both pre-service and in-service programmes.

The Ethiopian Ministry of Education is working on making the teacher education curricula at all levels address the cross-cutting issues identified in the guiding policy document. Currently, the Ministry of Education is implementing a newly revised primary teacher education curriculum, designed to train teachers of grades 1 to 8. The teacher education for primary schools is conducted by regional colleges. The new curriculum includes a newly developed course entitled *Cross-Cutting Issues in Education*, which addresses issues on Environmental Education and Protection, gender, life skills and sexuality education.

Universities are responsible for secondary teacher education programmes, whose curriculum has not yet been revisited as per the policy direction on environmental education. However, the universities that are offering the training are able to initiate change for the integration of environmental education into the programme. Accordingly, Bahir Dar University has initiated a plan to incorporate Education for Sustainable Development (ESD) issues into its secondary teacher education programme, thereby setting an example for other universities. If the initiative is successful, other universities that are offering the training might follow the example and implement similar changes in their programmes.

Institutional context

Bahir Dar University has a vision of becoming one of the ten premier research universities in Africa by 2025 (BDU, 2012). Its mission is to contribute substantially to the sustainable development of the nation and beyond through high quality education, research and community service. The university is now among the largest universities in the Federal Democratic Republic of Ethiopia, with more than 35,000 students in its 57 undergraduate and 39 graduate programmes.

Bahir Dar University includes four colleges, three institutes, three faculties and one school. The academic units of the university include the College of Science, College of Agriculture and Environmental Sciences, College of Medical and Health Sciences, College of Business and Economics, Institute of Technology, Institute of Textile, Garment and Fashion Design, Institute of Land Administration, Blue Nile Water Institute, Faculty of Humanities, Faculty of Social Sciences, Faculty of Education and Behavioral Sciences, and the School of Law.

The Bahir Dar University is supporting the country's development plans in various fronts. The Ethiopian Ministry of Education has stated that all university curricula should be competency based and modularised. The rationale for this direction is that Ethiopian universities have the responsibility of producing skilled manpower that meets the current and future demands of the country. Bahir Dar University is now revising its programmes to meet the national demands. The modularisation process underlines the need for putting the student at the centre of the teaching and learning process and promotes a constructivist approach.

The Change Project

The Faculty of Educational and Behavioral Sciences is running a one-year Secondary School Teacher Education programme entitled the Post Graduate Diploma for Teachers (PGDT). The PGDT programme is a professional training programme designed to educate students with an undergraduate degree in secondary school subjects. The curriculum of this programme is composed of general education courses, subject specific methodology courses and a practicum. The main objective of our Change Project is to introduce the teacher trainees to the principles and practices of ESD. The faculty is also training experts in the areas of curriculum development and instruction, educational planning and management, special needs education and school psychology. The project provides the chance to consider integrating ESD into these programmes.

Goals of the Change Project

Considering the national and institutional context, the aims of this Change Project are 1) to design a course on ESD to be offered in the secondary teacher education programme at Bahir Dar University; 2) to advocate ESD in the university community by organising different forums; and 3) to create a link with other international universities in the area of ESD to share experiences.

Processes of the project

Informed by the preparatory phase and Sida's International Training Programme on ESD, the main activities in the implementation phase of the project included collection of relevant resources, auditing the existing curricula for the extent in which ESD is integrated using the USAT tool, and organising an ESD workshop. The collected resources included ESD modules from different countries prepared for teacher education programmes, as well as reports and reviews of the experiences of different countries on the integration of ESD into teacher education curricula.

The other main activity that has been accomplished in the project was an audit of the integration of ESD into the existing secondary teacher education curricula using the USAT tool. As the main purpose of the Change Project is related to curriculum change, only the curriculum and teaching approach sections of the USAT tool were applied as frameworks for the audit. As the candidates of the one-year teacher education programme (PGDT) have completed their first degree in one of the secondary school subjects, examining the background of these candidates in terms of their exposure to the principles of ESD was found to be valuable. For this purpose, the curricula of the candidates' ten undergraduate programmes were audited. In addition, the PGDT curriculum itself was subjected to an audit.[22] The recent modularised version of the curriculum of each of the programmes was used for the audit. To supplement the USAT tool, information had been gathered from lecturers through interviews. The interview results gave insights into the actual teaching approaches that are applied by the lecturers in their teaching.

Following the curriculum audit, a workshop was organised for the university staff. The purpose of the workshop was to create awareness about ESD in higher education in general and about the Change Project in particular. It was also intended to get feedback on the project. The project was further developed in a regional ESD workshop conducted at Rhodes University. Following all this, one core ESD module and two subject specific ESD modules were developed as a way of integrating ESD into the teacher education programme in the university. To further strengthen the integration, a student ESD club was established. The various processes of the Change Project are further explained in the following sections.

Implementation: integrating ESD into the Bahir Dar University

Results of the ESD audit

The results of the audit using the USAT tool revealed that teacher education candidates come to the one-year teacher education program (PGDT) with a varying degree of exposure to the principles and practices of ESD. As indicated in Figure 1, in terms of content, candidates from Civics and Ethical Studies have received the highest exposure to the major principles of ESD. Candidates from the Geography and Environmental Studies and Biology programmes are second and third in terms of having received some experience in ESD in their undergraduate programmes. However, students in the remaining programmes have got very little background in ESD.
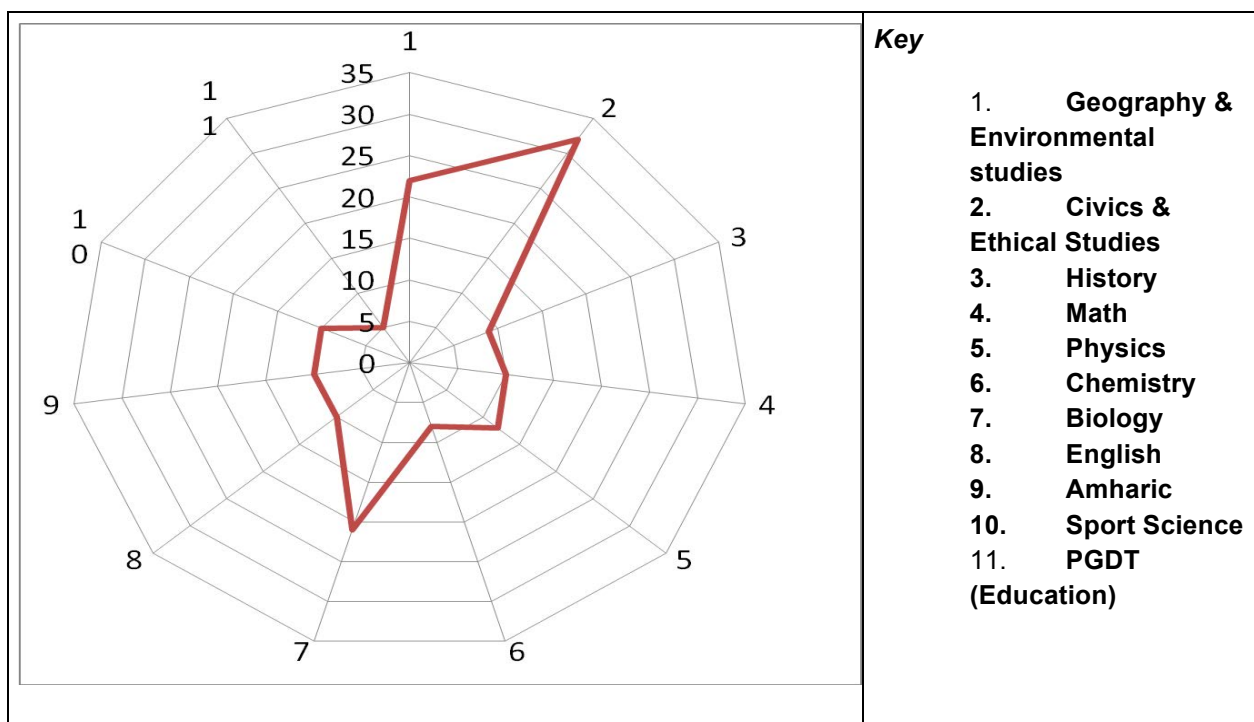
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[22] The list of audited program include; Geography and Environmental Studies, Civics and Ethical Education, Biology, Chemistry, Physics, Mathematics, History, Sport Science, Amharic, English, Education (PGDT).

The teaching approaches being used in all of the programmes subject to the audit, were predominantly classroom based, dominated by teacher lectures followed by group discussions and sometimes group assignments. Students' involvement in the teaching and learning process is limited to group discussions and reading of reference materials recommended by the teacher. In this regard, methods like case analysis and collaborative project works that promote ESD principles are rarely applied.

Another result of the audit was the partial treatment of ESD components by the different programmes. Except for the Civics and Ethical Studies programme, the contents of the programmes emphases only the environmental dimension of ESD. Similarly, the ESD related courses included in the programmes do not give much attention to the values and ethical aspects of ESD. They are mainly designed to transmit information about global environmental issues.

Thus, the overall need for the integration of ESD principles into the existing teacher education programme emerged from the audit. Moreover, the university should consider the integration of ESD principles in the ongoing modularisation process of the university's education programme.

Figure 1: Average sustainability performance per undergraduate programme

Key

1. **Geography & Environmental studies**
2. **Civics & Ethical Studies**
3. **History**
4. **Math**
5. **Physics**
6. **Chemistry**
7. **Biology**
8. **English**
9. **Amharic**
10. **Sport Science**
11. **PGDT (Education)**

ESD workshop at Bahir Dar University

In October 2013, an ESD workshop for the entire university was organised by the Faculty of Educational and Behavioral Sciences. The objectives of the workshop were to a) create awareness among the university community of the role that universities play in sustainable development; b) to show some practical examples of integrating ESD principles into the teaching, research and community service functions of the university; and c) to discuss the evaluation of the integration of ESD into the teacher education curricula of the university. The target audience of the workshop included university higher officials, Deans and programme managers of Colleges / Faculties / Institutes, and the teaching staff of the Faculty of Educational and Behavioral Sciences.

During the workshop, Professor Heila Lotz-Sisitka, the regional ITP coordinator from Rhodes University, gave a presentation on the role of higher education for sustainable development. The ESD audit report was also presented in the workshop. Following the presentations, there was a very engaging question and answer session. The workshop achieved its objectives by creating awareness amongst the participants of the

principles of ESD in higher education at large. Moreover, the comments received from the audience provided useful insights for the project.

Further development of the Change Project in a regional ESD workshop

The project originators had the chance to share the accomplishments of the project with ITP participants in the African region. During the ITP training at Rhodes University, a lot of insights had been gained about ESD and our Change Project. There were different presentations made by different professors; the overall discussions with the ITP participants on the presentations were informative and enlightening; and there was also a teacher education special group discussion with the Environment Learning Center staff at Rhodes University. Ample amount of resources that are helpful to the Change Project were also collected in the process. By the end of the training, we had decided what approaches we should follow in order to introduce ESD into our teacher education programme at Bahir Dar University. On the basis of the understandings that we had developed so far regarding ESD in teacher education, we had come to the conclusion that our approach should have multiple dimensions. We learned that there is no one best approach to successfully integrate ESD into teacher education programmes. Hence, we decided to have one core module that all teacher education students will take, and other small modules specific to each programme that can be combined into the specific teaching methodology courses. In addition, we also proposed to initiate an ESD student club where we can support the students to undertake ESD activities.

Development of the ESD module

One of the major accomplishments of the project was the development of ESD modules to be used for teacher training. One core module and adapted versions of the Fundisa for Change's subject specific modules had been prepared. For the core ESD module, we mainly adapted the contents of ESD training material designed for teacher education by UNESCO in 2010. We found this material, entitled *Teaching and Learning for a Sustainable Future,* more comprehensive than other available resources on the issue in that it exhaustively addresses all components of ESD. It also allows for adaptation to a local context. Out of the 27 modules included in the material, we selected six and adapted them to our local context.[23] We managed to get locally produced resources related to climate change in Ethiopia. These resources were helpful to contextualise the module contents and make them meaningful to learners. With regard to the subject specific modules, geography and biology subject methodology teachers in the university had adapted and tried out the Fundisa for Change modules in March and April 2014. The teachers found these materials very useful and decided to further integrate them into their courses. They have reflected that there is a need to relate the suggested specific methods of teaching ESD related topics with the actual topics included in the Grades 9-10 curricula.

The newly designed ESD module has three Credit Points. It is offered to PGDT students as of September 2014, which is the beginning of the new academic year. The subject specific ESD modules will be further integrated into the already existing subject methodology courses of the programme, taking into consideration the results of the first trial.

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[23] The titles of the selected chapters are Exploring Global Realities, Understanding Sustainable Development, A Futures Perspective in Curriculum, Reorienting Education for a Sustainable Future, Sustainable Future Across the Curriculum, and Climate Change.

ESD student club

Another major accomplishment of the project has been the establishment of a student ESD club. The club will serve as a means of advocating ESD among the university community through the students. Generally, the students' voice is heard by university authorities and the club could thus help to create a favourable environment to initiate and implement ESD based changes and advocacies through the students. A club guideline has been developed, which explains the aims of the club, club membership, and legal ground of the club. The university's higher officials accepted the guideline and the clubs actual work has started by registering members.

Students in the university have shown a keen interest to participate in such co-curricular activities, partly because it is a requirement for them to take part in a community service. They also want certificates that testify their participation in such current issues, which they can add to their CV. As a result, not only teacher trainees but also students from other departments are joining the club. This is a big opportunity to mobilise students in the university to advocate ESD not only within the university but also in the wider community.

In May 2014, the ESD student club was officially launched and began its activities. So far, a number of orientation programmes about the objectives of the club have been organised. During the break at the end of the academic year, i.e. July and August 2014, the club members were to work on assignments that urged them to critically observe the changes in the natural environment and its consequences around their home villages. They are asked to come up with local stories of climate change in the new academic year.

Outcome of the Change Project

The project has resulted in the integration of ESD into the teacher education curricula. This integration will need to be followed up on and continuous support must be provided to the teachers who are involved in teaching ESD related courses. It has also enabled the students to be active agents of change in promoting ESD to the university community through setting up the first student ESD club. These experiences of the university will be communicated to the Federal Ministry of Education, so that the programme outcomes can be integrated into other universities that offer similar programmes in the country.

There are also intentions of initiating the establishment of an ESD centre that could coordinate the overall efforts of the university in addressing the issue of sustainable development through its teaching-learning, research and community service programs. Higher officials of the university are discussing the idea, which hopefully results in a positive response. Moreover, the university will grant a moderate fund for ESD related projects. We are now in discussion with various people from the different disciplines to form a team that could develop the project. Rhodes University, South Africa, confirmed that it will share its experiences to help establish the centre.

Challenges and constraints in implementing ESD

The challenges and constraints encountered in the implementation of this Change Project were minimal. The university was facilitating and supporting the process from day one. This could be primarily because the people in decision-making positions were familiar with ESD prior to the implantation of the project. For example, the Vice President for Academic Affairs of the university attended the ITP in 2010, as a co-participant with another staff member from the university. The Dean of the Faculty of Educational and Behavioral Faculty, who runs this Change Project, participated in the ITP programme as a co-participant. The involvement of these two people in important positions has been decisive for the successful accomplishment of the Change Project. Moreover, the pressing need for addressing climate change challenges internationally,

and Ethiopia's response to this need in terms of its policies in various sectors, push the university to be sensitive to ESD related projects.

The continuous nature of the programme has also contributed to the success of the Change Project. There was an intensive training and experience sharing opportunity not only on the concept of ESD but also on change management related to ESD in higher education in both Sweden and South Africa. The regional advisor has always been very supportive. She has paid two visits to our institution for face-to-face discussions and feedback on the project. Her presentation on the topic *ESD and Higher Education* to the staff at the university during the institutional ESD workshop has helped us to bring the issue of ESD into the attention of the university community, including higher officials of the university. Having a project partner at an institution level has been a wonderful strategy to get not only professional but also emotional support. The way the project is designed provides us the opportunity to feel ownership and engage ourselves in the process. Overall, the training programme involves innovative approaches that significantly contribute to the success of our ESD Change Project.

Conclusion

Education for Sustainable Development remains to be central to the post-2015 global development agenda as education is a vehicle for development (UNESCO, 2014). On the other hand, Education for Sustainable Development (ESD) recognises that it is impossible to achieve sustainable development without appropriate education, training and public awareness for all sectors of society. This calls for the need to integrate ESD into the education system at all levels, including higher education. But this is not an easy task as ESD is basically about values (UNESCO, 2009). It entails respect for others, including the future generation, regardless of differences in ethnicity, gender, geographical location, economic status. It is also a question of caring for nature and utilising natural resources responsibly. The ESD Change Project described in this chapter could serve as one example of introducing ESD into a higher education system in general and into a teacher education programme in particular. The chapter also highlights the need to consider the national and institutional context for successful integration of such change projects.

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Chapter 17: Integrating ESD Into The Home Economics Programme Of Alexandria University, Egypt

Mona Sharaf Abdelgalil

(Alexandria University, Egypt)

Abstract

This chapter highlights our efforts to mainstream Education for Sustainable Development (ESD) into the Department of Home Economics Education in the Alexandria University in Egypt. The main aim of the project is to reorient and develop the curriculum of household management and family sciences for both undergraduate and postgraduate students to provide a greater focus on sustainable development and sustainable innovation. The sustainable development strategy of the Home Economics Education Department emphasises the role that education can play in both raising awareness among students about sustainable development and giving them the skills to put sustainable development into practice. It places priority on the development of sustainability literacy as a core competence for graduates, training them to be transformative agents of Education for Sustainable Development (ESD). I believe that active home economists should work towards improvement of their community through economic participation, social inclusion, and other efforts to improve life for all citizens. The objective of this Change Project is to mainstream and implement the idea of sustainability in the household management education programme at the Faculty of Specific Education in Alexandria University. ESD is implemented by reorienting existing courses to emphasis sustainable development, by developing new courses on both undergraduate and postgraduate level, by holding an information day for all students, and by integrating sustainability concerns into the scientific research plan of the Faculty of Specific Education.

The role of household management education in sustainable development

Household management is one of the areas covered by home economics studies, which is addressed to students aged 12 to 18 in middle and secondary schools in Egypt. Through the home economics curriculum, the individual is provided with the opportunity to develop personal empowerment capabilities to act in daily contexts. Household management brings together academic knowledge (theory) and everyday life skills (practice) and encourages students to think creatively. The content of household management education depends on the local culture and circumstances, but the underlying idea is to educate students to think globally. It relies on the premise of *Learning by doing*. At Alexandria University, home management education is concerned with multiple domains, such as human development, family time management, family budget, health awareness, food management, safety and security, craft training, and consumerism and consumer sciences. The overall objective is to study the daily lives and behaviour of the family and how they adapt to new situations. In the home management education courses we aim to enhance the quality of family life in the Egyptian household in order to empower students to fulfil an active role in the family and society.

Home economics and household management focuses on the family as the primary unit of change in human society. Moreover, household management perceives the household as a core economic unit, whose decisions and behaviour have an impact on the economic, social and ecological environment. It educates

students about the need for basic sanitation and good access to water as basic human rights. Courses such as *family health, family resources management, home tasks managements, family relations,* and *family health and the environment,* are designed to include a focus on family sustainability to integrate community issues. Improving the quality of life of individuals and families and the eradication of poverty are priorities of household management education. Thus, topics covered in the programme include resource management of household, income management, sustainable household production, food production, nutrition skills and health. It also allows students to turn knowledge into life skills. By turning the knowledge into everyday life skills, individuals and families can make the best use of the scarce resources available and also add value to them in a sustainable way. For example, students can do artisanal work using raw or consumed materials. Students can design and make their own garments in the graduation project course. They learn how to establish and market small business projects in the graduation project course based on a feasibility study. Household management skills can thus effectively contribute to the reduction of poverty and hunger and it provides an ideal subject to develop sustainable practices. Household management education enables and motivates learners to optimise their resources management in the sense of sustainable production and consumption.

Although the study of home economics can be used to achieve social sustainability and sustainable living for individuals, families and communities, it has not been optimised to do so and it is reaching fewer and fewer people (Abdelgalil, 2009). Traditionally, household management was intended for future homemakers who needed to be educated in the care and feeding of their families (Nawar, 2005). Nowadays, the domain of Home Economics Education seems quaint (Lichtenstein &Ludwig, 2010), and in Egypt only a small number of students are enrolled in home economics. Female students seem reluctant to study home economics at a university level, because the domain's name gives the impression that she cares only for cooking and cleaning (AboulEla & Abdelgalil, 2013). Perhaps as a consequence of this stigma, the study of home economics is no longer compulsory at middle and secondary school. The Ministry of Education has stopped issuing the home economics textbook for girls at middle and secondary schools many years ago and teachers depend on the old textbook and their experience. Because the study of home economics became a non-compulsory course, many schools replaced home economics with subjects such as mathematics, science, and languages. This is particularly despairing considering that 2014 is the International Year of the Family.

This dire state of home economics in Egypt and the subject's alignment with sustainability provides room to reorient and revive the home economics curriculum to focus on contemporary issues of economical, societal and environmental sustainability. A Change Project was proposed to develop the household management curriculum at Alexandria University. The aim was to integrate sustainability concerns in the scientific research plan of the department and reorient courses by adding new objectives and practical activities related to contemporary issues.

The Change Project

The Change Project aimed to deliver a new strategy for household management for sustainable development, emphasising the role home economics education can play in raising awareness among young people about sustainable development as well as giving them the skills to put sustainable development into practice.

The curriculum objectives of the household management academic programme for under and postgraduate studies at the Faculty of Specific Education are reoriented or modified to:

- improve quality of the everyday lives of families;
- familiarise students with basic skills in the areas associated with household management, cognitive, knowledge and sciences associated in household management, as well as the use of modern strategies in the development of critical thinking and creative skills in domestic environments;
- raise the awareness level of the value of responsibility and consumer behaviour;
- engage students in the development of household small projects; and

- contribute to the discussion on sustainable development and the UN's Millennium Development Goals (MDGs).

There are two groups of key stakeholders in the project. The first are the under- and postgraduate students in the Department of Home Economics, who will become the future teachers of home economics. The second group is the decision makers. These include the Dean and the three Vice Deans of the Faculty of Specific Education (i.e. the Vice Dean of graduate studies and research, the Vice Dean of community service and environment development, and the Vice Dean for learning and students affairs), the Head of Department and staff members, some middle and secondary school teachers of home economics, who are in contact with the students during the applied practical teaching in schools, and the faculty centre of public service at the Faculty of Specific Education.

The implementation process

For this project, we adapted Kotter's (2012) process of leading change. The process involves the following steps:
- establish a sense of urgency;
- create a guiding coalition;
- develop a change vision to help direct the change efforts and create objectives to fulfil this vision;
- raise awareness and develop advocates to communicate this vision;
- enable broad-based action by removing obstacles to change;
- set short-term goals and celebrate the achievement of these goals;
- sustain and reinvigorate the change process by introducing new themes and projects; and
- institute the change by relating new behaviours to institutional success and outcomes.

Thus, we started of with an institutional audit, using the Unit-based Sustainability Assessment Tool (USAT) to assess the level of Education for Sustainable Development in the Faculty of Specific Education in Alexandria University (Togo & Lotz-Sisitka, 2009). The tool focused on the faculty Departments (the home economics and art education whom expressed their interest to participate in our survey), Scientific research plan, the courses' coordinators and if they apply the sustainability concerns in their courses plan? Or, how they are integrating sustainability concerns into their core functions of teaching, research and community engagement?

This tool allows for 'building the picture' of the department, for the integration of sustainability thinking across the departments, and creates possibilities for sustainability issues to be managed within functional units, as well as through a broader systemic framework, criteria and ways of representing results of a unit-based sustainability assessment using the USAT. We also used other data collection and auditing methods to complement the USAT in carrying out a sustainability assessment, such as Sustainability Assessment Questionnaire (SAQ), the Auditing Instrument for Sustainability in Higher Education (AISHE) and the tool for the Graphical Assessment for Sustainability in Higher Education (GASU). The questionnaire was targeted at Heads of Department (HODs) and the course coordinators to elicit their impression on the indicators before and after disseminating information on sustainable development.

The second step was a letter addressed to the Vice Dean of Research and Post-graduate affairs proposing amendments to some courses, taught by the author. These amendments included the incorporation of topics and training activities related to the development of sustainable household management. A second letter was send to the Vice Dean of Learning and Student Affairs to inform the vice dean of about the Change Project and to invite staff members to develop and link sustainability issues to their course on bachelor and master level. Suggested topics for inclusion were climate change, renewable energy management, harmful substances and hazardous waste, marine resources and water management, pollution problems, environmental resource management and conservation, air quality and air pollutants.

This invitation and suggested topics for inclusion were derived from a third questionnaire addressed to various stakeholders in the university and civil society. This questionnaire focussed on the scientific content of various courses and what links needed to be developed between current course content and sustainable development.

A third step included focus groups with stakeholders and a general seminar, which were undertaken to develop awareness and advocacy on sustainable development. After a meeting with the Dean, for example, a seminar was held for Home Economics staff members describing the aim of the training programme and disseminating sustainable development. Part of the discussion focussed on how to enrol the sustainable development in the scientific research plan of the department. After that, a meeting with the Vice Dean for Learning and Student Affairs was held to discuss how to implement a new course design. The objectives of the new course were discussed and approved by the department council.

Subsequently a general seminar on sustainable development and the Change Project was organised for students, staff member, and other stakeholders, urging everyone to participate. The information day resulted the willingness of some staff members to know more about sustainable development and MDGs and how to include sustainability issues in their curriculum to strengthen capacity of students by giving them exposure to knowledge concerning past, current and future sustainability challenges.

The outcomes of the Change Project

This section summarises the outcomes of the project at the undergraduate level, postgraduate level, within the Faculty of Specific Education in general and outside of the Alexandria University.

Outcomes at undergraduate level

To integrate ESD into the undergraduate curriculum, we reoriented some existing courses to focus more on sustainability, developed a new course, and organised an activities project week.

Firstly, we took a look at the existing courses and reoriented some of them to emphasise issues of sustainability. The following courses were remodelled:
- Family health;
- Home tasks management;
- Family economics and consumer guidance;
- Home decorating; and
- Graduation project in household management.

For example, sustainability concerns were integrated through the research projects in the course *Family economics and consumer guidance*. Students' research focussed on operational practices that included ideas for domestic waste reduction, such as the use of breadcrumbs that would otherwise end up in the trash, and how to safe or rationalise water and energy consumption. The courses *Family health* and *Home decorating* discussed new topics, such as carbon dioxide and air pollution reduction, safe gas stove use, and energy and water conservation practices. In the course *Graduation project in household management* the students learn and practice how to establish small domestic projects and how to undertake a feasibility study for a selected project. These projects might focus on food conservation, tricot, crochet, or sewing and aim to fight poverty by developing practical life skills.

Secondly, a new undergraduate module was developed entitled *Strategies for sustainable living and family wellbeing (Sustainability Management)* by Dr Mona Abdelgalil. The course explores the use of management systems and performance frameworks to make sustainability part of daily family life tasks. Projects, activities

and ideas are used to reinforce the concepts and develop skills to enable students to use the knowledge imparted in the course. The module description is attached in Appendix B.

Thirdly, we held a special week organised for sustainable development activities. All students from grade one to four participated in such activities. The events included:
- Catching pollution at home; by the end of this activity students specify which places are most polluted at home.
- Recycling food containers (e.g. yoghurt containers and fruit cups) to make candle moulds.
- Coming up with ideas for reusing cans, plastic bottles and egg cartons.
- The story of stuff; by the end of this activity students should have developed a willingness to change their consumption behaviour.
- Recycle unused garments.
- Reuse leftover fabrics in the production of small cushions.
- Reuse used pots for planting herbs and vegetables.

Fourthly, a workshop was organised in a collaboration between the Art Education Department (represented by Dr Ahmed Kadry) and the Home Economics Department (represented by Dr Amira Shetewi and Dr Niveen El Wardany). In the workshop undergraduate students (fourth year) made cakes in the shape of an African mask and submarines using natural friendly environment colours to promote ecological literacy, talking about the natural resources, cultures and Identity before demonstrations.

Outcomes at postgraduate level

At the postgraduate level the aim of the Change Project was to enrol sustainable development, with its three pillars, into the scientific research plan of the household management programme for Master and PhD degrees. The following five Master and PhD thesis proposals on the subject of sustainable development have been approved:
- Master thesis entitled *The effectiveness of a training programme to develop consumer skills in making a fortified bread and its impact on management and simplification of domestic tasks,* by a student who is also a home economics teacher at a private middle school.
- Master thesis entitled *Knowledge and attitudes of girls at middle schools about the danger of early marriage,* by a student who is a teacher at a public middle school.
- Master thesis entitled *Training programme to develop women's knowledge and skills toward family resources management to improve family crises management level,* by a student who is a teacher at a public middle school.
- PhD thesis entitled *The effectiveness of a training programme for developing time management skills for life satisfaction on a sample of Alexandria university students,* by a lecturer assistant in the Department of Home Economics.
  PhD thesis entitled *Training programme for raising the knowledge level of girls towards furnishing and equipping of the home. A comparative study between rural and urban area in Alexandria Governorate.*

Postgraduate students are also encouraged to attend and present their work at national and international conferences related to ESD.

Besides integrating ESD into the scientific research plan of the department, we also reoriented existing Master courses to emphasise ESD related notions in the household management programme. In particular, the courses *Family health and the environment* and *Advanced home tasks management* were remodelled to accommodate ESD.

ESD was also developed outside of the Home Economics Department. A new Master course was recently adopted in the Department of Art Education. The course *Green art and culture* addresses topics related to

sustainability and environment. It focuses on green thinking and the reflection of green art on the use of safe and healthy materials, tools, and methods in various technical fields (e.g. photography, print, and sculpture) and how to take advantage of this thinking in the applications in school programmes and different activities.

Outcomes at faculty level and beyond

The Change Project was not restricted to students in the Home Economics Department and the Department of Art Education; it also introduced ESD to all students in the Faculty of Specific Education. For example, a chapter entitled *Human rights to water* was added to *Consumer rights* course in the *Human rights* module, which is a compulsory course for all first year students in the faculty. Furthermore, with the cooperation of the cultural committee of the faculty headed by Dr Dhalia Kabbary (Music Education), a presentation was given to all faculty students during an information day on *sustainable development and libraries*. It was presented by Dr Mona Abdelgalil (Home Economics) and Dr. Amal Karam (Education Technology). Dr Soheir Ahmed (Pedagogic Science) also spoke about complementary development issues.

Additionally, we developed a training programme for some home economics schoolteachers and some undergraduate students on how to involve sustainability issues in the home economics classes in middle and secondary schools. This was accompanied by practical artisanal work using pearls to make household accessories. The trainer, Ms Safaa Shaaban, is a postgraduate student and a teacher of Home Economics in a middle school.

We are also actively involved in promising and exciting activities to spread the ESD message. For example, Alexandria University hosted the 1st International Conference on *Specific Education for Sustainable Development.* The report of the conference can be found on the website of the International Federation for Home Economics (IFHE).

Recommendations following from a workshop on the family

In 2013, a workshop was held in Alexandria to present the outcomes of the Change Project and its relevance to the family. The workshop was attended by the ITP coordinator for the African region, sixty-five faculty staff members, the Dean of Graduate Studies and Research Institute, the Vice Dean of the Faculty of Kindergarten, and students from the Department of Home Economics and Art and Music Education. Various recommendations emerged from the workshop, as summarised below.

- The Faculty of Specific Education adopted the idea of establishing a Centre for Research and Innovation for the family service, called *Friends of Sustainable Development for the Family.*
- Urge the Ministry of Education and education departments in Egypt to pay attention to teaching home economics for sustainable development in schools and to provide home economics education as compulsory curriculum in schools starting from elementary school to middle and high school. The Ministry of Education and education departments should highlight household management education, because of its role in streaming the awareness of resources management (natural, human and non-human resources), family health and nutrition, social relations, child and maternity care as well as the awareness of rational and sustainable consumption.
- Organise an annual conference of Education for Sustainable Development for the family and for society involving students and faculty members in order to promote the family socially, economically and environmentally.
- Deepen the understanding of environmental, socio cultural and economic dimensions of sustainable development in the educational curriculum for all faculty departments as well as the home economics school curriculum.
- Encourage voluntary participation to raise awareness in society about family health, nutrition, and sustainable and rational consumption. Also to promote the importance of establishing

small home business projects based on new skills to establish producing rather than consuming families, in order to combat poverty and diseases and raise the standard of living.

- Promote the importance of household waste management and preserving the environment.

- Recycle and reuse exam papers and raw materials from the exams.

Following the recommendations of the workshop in 2013, we organised an international conference in 2014 entitled *Specific Education for Sustainable Development* with the support of the International Federation for Home Economics (IFHE), and the International Society for Education through Art (INSEA). The conference brought together participants from different universities in Egypt and international speakers from Bonn University in Germany, University of the Free State in South Africa, Ahfad University for women in Sudan, and the "Learn with Grandma" foundation in Wales. The seventy-five research papers we received, all aligned with the objectives of the conference, which were to:

- support the innovation and development of the environment as well as families and individuals for sustainable future;
- exchange national and international experiences in using and teaching art, music, home economics and technology education for sustainable development;
- encourage scientists and researchers to develop and modernise the role of Specific Education in the sustainable development;
- enhance teaching strategies and e-learning for developing learners' skills to go with the challenges of the twenty-first century; and
- to suggest creative academic recommendations to figure a new vision for Specific Education.

Conclusion

From our experience with increasing the quality of Education for Sustainable Development at the Home Economics Department of Alexandria University, we can outline some recommendations for others with similar intentions:

- begin learning processes that include as many people as possible through individual interactions;
- approach all levels in the educational organisation in order to influence change on programme as well as course level and to gain support and create legitimacy for the work;
- plan for ESD related workshops and discussions to provide input for other projects at the university; and
- for courses in household management and sustainable development that form part of a larger programme, it is important to connect to the special challenges and methods that are particularly relevant for the programme area, thus covering both breadth and depth is important.

We hope that these activities will help to heal our society. Help create a more caring community. By encouraging people to get to know each other, help preserve local skills, knowledge and memories, we hope to build more sustainable communities.

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Acknowledgment

APPENDIX A
MODULE DESCRIPTION FORM

Title: Strategies for Sustainable living and family wellbeing (Sustainability Management)

1. **Level: Grade four**
2. **Credits: 2 (1 Lecture; 2 Activities)**
3. **Pre-requisite or co-requisite modules: Chemistry, Family health, Family relations**

Brief description of aims and content
The course explores the use of management systems and performance frameworks to make sustainability part of family daily life tasks. Projects, activities and ideas are used to reinforce the concepts and develop the skills to enable students to use the knowledge imparted in the course.

Learning outcomes
Knowledge and understanding
Having successfully completed the module, students should be able to:
• Define sustainable development
• Define social sustainability and sustainable living

- Link global and local issues relevant to domestic environment
- Identify some pollutants found in homes, e.g. indoor air pollution, carbon dioxide and gas stove, plastic pipes and bottles of water.
- Identify a variety of tools to promote some practices in managing sustainability.

Practical Skills

Having successfully completed the module, students should be able to:
- Manage everyday domestic waste.
- Conserve resources.
- Manage household materials.
- Reduce waste.
- Reuse materials.
- Recycle specific domestic wastes, e.g. food, paper, fabrics, plastic containers, household medical and pharmaceutical waste.
- Specify pollutants in home environments, e.g. second hand smoke, combustion pollutants (e.g. carbon monoxide, nitrogen dioxide NO_2), volatile organic compounds (VOCs) (e.g.chemicals found in paint, cleaning supplies, pesticides, building materials, furnishing, air fresheners and dry cleaned clothing).
- Promote green products (i.e. renew garments, making new wall suspensions, cushions, pillows for decorating homes using old fabrics, making children's toys by using unused clothes and materials, making new candles from used candles).

Indicative content

Learning and teaching strategy

Strategies include lectures, learning by doing, and cooperative teaching.

Outcomes	Learning strategy – activities	Assessment
1. Define sustainable development 2. Define social sustainability and sustainable living 3. Link global and local issues relevant to domestic environment 4. Identify some pollutants found in homes, e.g. indoor air pollution, domestic waste management,climate change, carbon dioxide and gas stove, plastic pipes and bottles of water, food safety 5. Identify a variety of tools to promote some practices in managing sustainability.	Lecture Group presentation	Examination at midterm and the second one at the end of the semester to test knowledge.
Conservation resources: 6. Save water.	Activities: Stop the drip Check the flow Catch a shower	Report on the results of the experiments
Conservation resources: 7. Save energy /electricity.	Activities: Self learning skills List of all electronic	Report presentation about some good energy saving ideas and stories about life without electricity

	appliances in home, show it and talk with some people +70 years	from the elders.
8. Waste management. 9. Manage everyday domestic waste.	Learning by doing, team work. Activities: • Reusing different old fabrics, clothes and materials. • Recycle food residues to produce novel recipe. • Reuse unused cooking clay pots in planting and flower arrangement. • Reuse plastic containers. • Recycled food containers. • Reduce Medical and pharmaceutical waste.	1. Production of new products, e.g. cushions , pillows, quilt, suspension and toys. 2. Sensory evaluation for new recipes. 3. Production of flower pots. 4. Pince, pen and flower holder 5. Candle molds. 6. Poster explaining ways or tips to manage pharmaceutical waste.
Indoor air quality; indoor air pollution	Activities: Catch pollution in home	Result of the experiment

Chapter 18: ESD In Early Childhood Education And Educational Management And Leadership Courses In The Faculty Of Education at the University of Botswana

Gabatshwane, T. Tsayang and Kabita Bose

(University of Botswana, Botswana)

Abstract

The Change Project is based in the Faculty of Education at the University of Botswana (UB) and intended to enrich curriculum by infusing ESD into courses for capacity development of Educational Managers and Early Childhood Education (ECE) teachers at undergraduate level. A study was conducted in the Faculty of Education to establish the understanding of ESD by the academic staff and students; to assess the actual practices in ESD; and to find out whether students are able to identify activities and opportunities for ESD at UB. A survey design was adopted, and the USAT tool was adapted to develop two sets of questionnaires for academic staff and students as well as a semi-structured interview guide for Head of Departments. The sample consisted of 159 BEd Management, BEd Primary and ECE students, as well as 43 academic staff and Head of the Departments of six teacher training departments in the Faculty of Education. The findings show that ESD issues are inadequately addressed in the Faculty of Education in UB; ESD is often confused with Environmental Education (EE); staff need sensitisation through in-service training / short courses; and the majority of students either did not understand the issues of ESD or they did not think any opportunities / activities existed that could promote ESD. Warranted by the findings, the researchers recommended the development of two courses for ECE teachers (Early Childhood Education for Sustainable Development) and Educational Managers (Managing and Leading Education for Sustainable Development), which are basically practical oriented projects supported by theory.

Introduction

The Change Project is based in the Faculty of Education at the University of Botswana. The Faculty offers programmes and courses to school teachers and managers in Early Childhood Education (ECE), Educational Management and Leadership (EML), Environmental Education (EE), Maths and Science Education, Language Education, Social Studies Education, Religious Education, and Art and Music Education. This project intended to enrich curriculum by infusing ESD into courses for capacity development of Educational Managers and ECE teachers. The intention of this Change Project was to develop two courses at undergraduate level that have an inclination for ESD. The project was carried out by two Primary Educators (the authors of this chapter), one specialises in Educational Management and Leadership, and the other specialises in Early Childhood Education. The notion of citizen empowerment was also taken into consideration in drawing up the proposal. Both authors are females and this is in line with international efforts to develop feminine participation in international and national issues.

The project rationale

The Change Project is about integrating issues of sustainable development into ECE and EML programmes. The courses are meant for in-service early childhood educators and educational managers, who should return to their institutions and ensure that ESD is part and parcel of the education system, both in practice and theory. Education managers and teachers are the driving force for the achievement of educational goals in schools. As facilitators in the school system, their knowledge of issues related to sustainability cannot be overemphasised. Hence, there is a need to integrate ESD into ECE and EML courses. *Lore lo Ojwa Lo sale Metsi*, is a Setswana proverb that means a twig of a tree can be bent better without breaking while it is still green and tender, which can be applied to early childhood education. It is better to educate and mould people at their tender age as experiences in the early years have and extreme influence on the overall development of a child and impacts the entire human life span. Thus, ESD awareness and skills are most effectively introduced to children in their formative years. This is also in appreciation of the fact that children, who are the future of any country, are the ones to bear the adverse consequences of the mismanagement of the issues relating to ESD (UNESCO, 2008). The Ministry of Education and Skills Development (MoE&SD) of Botswana has thus developed curricular frameworks for 0-3 and 3-6 year-olds, which deliberately accommodates ESD so that from an early age, learners can be accustomed to ESD issues and hence internalise and be conscious of how to address these issues throughout their lifespan. It is therefore necessary to train teachers and educational managers for ECE centres in the infusion of ESD in the classrooms.

Contextual considerations

In Botswana, environment and sustainability issues are given high priority. The desert status of the country, the scarcity of water, heavy reliance on the mineral sector, and the existence of booming cattle and tourism industries make environment and sustainability issues of high interest and importance. This is reflected in Botswana's national vision, Vision 2016, which strongly emphasises all three dimensions of sustainable development, namely economic sustainability, socio-political sustainability, and environmental sustainability (Republic of Botswana, 1997). Besides the Vision 2016, this Change Project aligns well with other national and international policies and strategies, in which ESD issues are emphasised such as Botswana's Revised National Policy on Education, which calls for ESD across the curriculum (Republic of Botswana, 1994); the Southern African Development Community (SADC) treaty, Article 5(1) of the SADC treaty which stresses the importance of sustainable utilisation of natural resources and effective protection of the environment, and above all, the promotion of sustainable development (SADC, 1992); the United Nations Decade of Education for Sustainable Development (UNDESD, 2005); the Millennium Development Goals (MDGs) (Millennium Project, 2006); and the University of Botswana's Research Strategy, which has identified environment and sustainability as one of the priority areas for research during the National Development Plan 10 (University of Botswana, 2008a, 2008b).

The University of Botswana attempts to realise ESD through infusing its graduate attributes in all courses. These graduate traits include ICT knowledge and skills, self-directed, lifelong learning skills, critical and creative thinking skills, problem-solving skills, communication skills, entrepreneurship and employability skills, organisational and teamwork skills, research skills and information literacy, social responsibility and leadership skills, interpersonal skills, cross-cultural fluency, accountability and ethical standards.

The Change Project

Before developing the courses, we decided to assess the status of ESD in the Faculty of Education. The bulk of ECE teachers and school managers exit at the undergraduate level. Thus, in order to assess the realisation of ESD, a study focusing on undergraduate level was conducted. The objectives of the study were to establish

an understanding of ESD by the academic staff; to assess the actual practices in ESD; to assess the understanding of ESD by the students; and to find out whether students are able to identify activities and opportunities for ESD at the University of Botswana. Discussions were held with the key participants, such as the Change Project Coordinator and implementer at Rhodes University and Sweden and some ESD alumni, which resulted in the adaptation of the USAT tool. Three instruments were developed, two sets of questionnaires for academic staff and students, and an interview guide (semi-structured) for Head of Departments. The sample consisted of BEd Management, BEd Primary and ECE students (159), as well as academic staff (43) and Head of the Departments of six (6) teacher training departments in the Faculty of Education, UB.

The findings show an agreement between academic staff and Head of Department that ESD issues are inadequately addressed in the Faculty of Education in UB, and that ESD is confused with Environmental Education. Whilst staff paints a rosy picture of ESD in teaching, assessment and curriculum, their responses with regard to their willingness to take part, their expertise in ESD issues, and their involvement in ESD related research is negative. This might imply that the alleged teaching, assessment curriculum development and community engagement are not informed by research. One of the recommendations made is that there is a need to sensitise the Faculty of Education staff and to provide them with in-service training on the concept, activities and issues of ESD, so that they are able to engage in research to ensure informed ESD related teaching, research and service to the community.

From the interviews emerged that the Head of Department have an understanding of the concept of ESD, which is reflected in the mission and vision of the UB and the respective departments. However, they also noted that whilst the mission and vision make reference to ESD and the UB graduate attributes intent to operationalise it, most of the academic staff members have not internalised these attributes. The Head of Departments said that there are implementation challenges of ESD. For instance, they said that research output is poor, implying that teaching is not supported by research on the current issues and this could prove problematic for sustainable development. They further said that content taught by some lecturers is passed on from year to year without making any changes to suit the contemporary context. They also mentioned that the methodology used for educating students does not commensurate with ensuring sustainable development. The Head of Departments also pointed out that staff often confuses ESD with Environmental Education (EE). As a result, they do not pay much attention to ESD as they think ESD is already been covered in the Languages and Social Sciences Education Department in the form of EE.

Thus, it was clear from the study that the graduate attributes of the UB were not clearly understood as indicators of ESD. In order to infuse and attain ESD, the Head of Departments made the following suggestions:

- an Action Research should be conducted to suggest and monitor improvements in course offerings;
- course outlines and teaching materials should be reviewed constantly;
- narratives of students' assessment of staff and courses should be taken into account by academic staff assessment;
- peer review should be part and parcel of teaching; and
- a methodology course on infusing graduate attributes into courses needs to be introduced for academic staff by the Centre for Academic Development of the UB .

The student questionnaire asked them to rate the activities and opportunities in environmental and sustainability areas, and provide indicators to support their responses. The questionnaire consisted of items regarding the Student Environmental Centre, the Career Counselling's focus on work opportunities related to ESD, environmental societies or other student groups with an ESD focus, sustainability practices in residences or dormitories by students, orientation programme(s) on sustainability for students, student ESD awareness programmes, voluntary community service by students, involvement of student groups across campus in sustainability initiatives, student council's involvement in ESD initiatives, student collaboration with

management in the area of ESD, activities initiated by students themselves in ESD, and students' willingness to take responsibility in the ESD.

Items	Dissatisfied	Don't Know	Satisfied
Student Environmental Centre	19	52	30
Career counselling focused on work opportunities related to ESD	21	30	49
Environmental societies or other student groups with ESD focus	19	47	33
Sustainability practices in residences or dormitories by students	23	63	14
Orientation programme(s) on sustainability for students	35	25	40
Student environmental and sustainability awareness programmes	30	36	35
Voluntary community service by students related to sustainability issues	23	40	37
Involvement of student groups across campus in sustainability initiatives	18	53	29
SRC involvement in ESD initiatives	20	52	28
Student collaboration with management in the area of ESD	18	57	26
E&S activities initiated by students themselves	16	57	26
Students' willingness to take responsibility in the ESD area	26	45	29

Table 1: Students views on activities and opportunities in environment and sustainability areas.

Table 1 shows the students' views on activities and opportunities in environment and sustainability areas. The majority of students either did not know about any opportunities and activities on ESD or they did not think such opportunities and activities could promote ESD. For example, students were asked to indicate whether they were satisfied, dissatisfied or did not know about education for sustainability practices and activities at their halls of residence. Only 14% expressed satisfaction, and the rest were either unaware or were not satisfied. On being asked about ESD activities initiated by students, only 26% expressed satisfaction, whilst the rest were either not aware or not satisfied at all. Except for career counselling (49%) and orientation

programmes (40%) where students felt there is a significant inclusion of ESD issues, the rest of the activities and opportunities seemed to be lacking. From this result it can be inferred that issues of ESD are either not understood by the majority of students or they are non-existent.

The results from both questionnaires seem to point to the same direction that ESD is not being realised in the Faculty of Education, UB. The graduate attributes that undergird the teaching policy in UB are intended to make sure that education provided to each and every student should promote sustainable development. Therefore, if both the students and staff cannot relate the graduate attributes to ESD, then it can be assumed that ESD is being promoted by both of them without being aware of it.

Warranted by the findings, we recommended that a short course for staff on understanding and linking of the graduate attributes to ESD is organised by the Centre for Academic Development in the UB. We further recommended the development of two courses at undergraduate level for ECE teachers and Educational Managers. The proposed courses are:

1. Early Childhood Education for Sustainable Development
2. Managing and Leading Education for Sustainable Development

These courses, as noted earlier, focus on the formative years, which are critical in building skills, attitudes and values, and the educational managers and teachers play a vital role in building that foundation. It was also proposed that the courses should be practical oriented projects supported by theory.

Consultative forum

The findings and the proposed courses were presented at a workshop at the University of Botswana (SADC MESA Chair on Curriculum development and Policy) in partnership with the SADC Regional Environmental Education Programme. Everybody involved in the Change Project was involved in the workshop and, therefore, the current Change Project participants took advantage of this opportunity to share with and receive comments from these stakeholders. After the presentation, the SADC workshop participants were given group work to brainstorm on the components of the proposed courses. In particular, they were requested to suggest topics and themes for the practical and theoretical components of the courses.

The group suggested that the students choose their own projects and work with a maximum of six students per group. They also suggested that the projects should be co-supervised by a specialist outside the department, and a detailed outline of projects should be developed regarding, for instance, length, content and budget to be developed by students. Timelines focusing on specific objectives should be specified, while research approaches that underpin a given project should be clearly defined.

Furthermore, it was suggested that the theoretical components of the course focus on:

- historical development of ESD;
- theories of learning and their relation to Education and Sustainable Development, e.g. cognitivist, liberal, constructivist, and social learning;
- using methods with purpose;
- change and change theories;
- management of change and leadership; and
- issue-based and asset-based approaches to topic selection.

Regarding the practical components of the courses, it was suggested that they include:

- sorting waste and a recycling centre;

- compost manure making;
- establishment of water harvesting mechanism and quantifying of water leakages;
- establish organic gardens;
- greening the campus through tree planting and sustainable landscaping;
- awareness campaigns and debate groups, e.g. computer graphics and animations about botanical gardens; and
- excursions to national museums and heritage sites.

Taking into advice the recommendations from the workshop and combining them with our auditing results, the two undergraduate courses were developed and are currently pending approval.

Conclusion

In general, there seems to be a trend in the Faculty of Education of the University of Botswana that not much is happening with regards to ESD infusion in the curriculum. This emerges from responses to questionnaires on curriculum implementation, research and community engagement, which are the three key performance areas of the University of Botswana. Carteron, Vermont and Stoll (2013), with the cooperation of members of the Responsible Management Network and the Euro MEd Management Sustainable Development Student Association, note that there are different types of people whose characteristics could act as a barrier to achievement of sustainable development goals. In particular, the type that may apply to the Faculty of Education is what they call the Darwinists inclined people. Inferring from Darwin's theory, Carteron et al. (2013) state that those who do not do anything about ESD believe in fate and these types of people believe that:

> ecological, cultural and sociological changes have always existed […] and they led to the extinction of some species, the changing of lifestyles, forcing people to change: natural selection […] sometimes labelled as cynics, these new "Darwinians" who believe that when the world is changing there are always some who lose out. Leave it to self-regulation and may the best win, survival of the fittest! That's the way it is, it's natural selection […]. You cannot save everyone […]. Let people do what they want […]. It is fate, a series of coincidences will solve the problem, […]. Life is competition, self-regulation (p. 4).

This description seems to characterise some of the participants in the Change Project, raising concerns about the highest learning institute in the country. If the Faculty of Education in UB has a Darwinistic attitude towards ESD, and yet they are supposed to be the pace setters in critically analysing and being able to solve the sustainability issues, then it is worrying. The Faculty of Education ought to be in the fore-front of interpreting and addressing issues in ESD. As the faculty trains teachers from ECE up to tertiary level, omission of the ESD issues in the curriculum will not achieve the expectations of the Decade of Education for Sustainable Development. Therefore, mainstreaming of ESD in the curriculum is critical.

There also appears to be confusion within the Faculty of Education about the distinction between EE and ESD. Whilst the UB's graduate attributes are intended to ensure realisation of ESD, some members of staff think that it is not their responsibility to infuse ESD, as they assume that this takes place in EE. Therefore, a lot of work needs to be done to create awareness about sustainability issues amongst the staff, who themselves are critical agents in educating the nation.

For students, lessons learnt from other countries could be applied in Botswana. For instance, students could benefit from ways other countries have realised ESD without necessarily making it very expensive. Practical lessons can be learnt from universities in Sweden on waste management, where students clearly mark waste containers in their refectories, halls of residence and in strategic points within institutional campuses to separate different types of waste. Another lesson that can be learnt is that instead of throwing leftover food in

the dumping site, it can be processed to generate biogas, which has the benefit of keeping the environment clean, providing the country with power as well as providing the students with positive attitudes towards their surroundings.

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Chapter 19: Integrating ESD Into The Higher Diploma Programme Of Dire Dawa University

Yonas Tadesse and Abeya Degefe

(Dire Dawe University, Ethiopia)

Abstract

In any country it is unlikely to realise sustainable development without maintaining a sustainable environment. This requires a society that is well informed of its challenges and has the relevant knowledge, skills, and motivation to address them. In order to achieve this, it is important to mainstream the concerns and issues of Education for Sustainable Development (ESD) into the regular curricula of the education system of the country. Hence, the main objective of our Change Project was to integrate ESD into the Higher Diploma Programme (HDP) of Dire Dawa University. HDP is a one-year training programme undertaken to equip higher institution lecturers and professors with necessary pedagogical skills and knowledge to enhance the quality of education. Sample instructors were identified across different departments, who were then interviewed to find out whether they were addressing ESD or sustainability issues while delivering their courses. None of them reported to have included sustainability issues in their course delivery. Thus, the Change Project was initiated to address the problem in the framework of the International Training Programme (ITP). In the implementation of the project, a number of action-oriented activities were identified and operationalised. These included ESD module development, pre-sensitisation and advocacy, public-sensitisation, approval of the project by the university's highest academic decision making body (the Senate), ESD module integration into existing HDP training document, module implementation and evaluation of module implementation. As a result, the following significant outcomes were produced: action-oriented ESD training module and manual were embedded into the HDP training document of the university, and awareness, network and linkages have been created with various national and local institutions.

Introduction

Education provides individuals and society with necessary skills, knowledge, values and perception to maintain the world in which we live and work in a sustainable manner. Education for Sustainable Development (ESD) is a new vision of education that people with different cultures and traditions respect and value the earth's natural resources through holistic educational methods and approaches (UNESCO, 2005). UNESCO (2005) further elaborates that ESD is a constantly developing idea that through a lifelong learning approach aims to empower all people to live a sustainable life. ESD aims to empower citizens to develop and evaluate alternative visions of a sustainable future and to work to collectively fulfil these visions. Hence, the general goal of ESD is strengthening the capacity of citizens to optimistically preserve their environment and society through participatory and systematic coordination of practical learning experiences and theories.

This chapter describes how Dire Dawa University (DDU) aims to take steps to reorient teachers toward ESD mainstreaming in all disciplines in more collaborative ways by integrating ESD principles and concepts into the ongoing Higher Diploma Programme (HDP).

Background of the project

Dire Dawa University is one of the growing higher institutions in Ethiopia committed to work strongly towards mainstreaming major concepts, principles and applications of sustainability into academic programmes, research and community engagement as a crucial success of the multidimensional programmes of the university. Dire Dawa University has been active in meeting MESA's objectives for ESD through its Change Project, which involved integrating ESD concepts with the university's Higher Diploma Programme (HDP). The Higher Diploma Programme was first introduced in October 2003 in reaction to the identified needs of teacher educators in all Teacher Education Institutes in Ethiopia as a new compulsory qualification to become a certified teacher educator (Hunde, 2008). The Ministry of Education later declared that the HDP is to be adopted by all Higher Education Institutions. Trainees of the HDP are expected to implement a learner-cantered teaching approach and continuous assessment to enhance the quality of education delivery (Jimma University, 2014).

The HDP at the Dire Dawa University is offered to all academic staff members, under the direction and guidance of the college of Social Sciences and Humanities. The duration of the programme is one academic year, which provides time for sessions, regular observation and feedback, school placement, action research, and professional meetings with the HDP leaders and HDP coordinator. The trainees have to complete a number of projects showing that their work for the diploma has had a significant impact on improving their own teaching practices, which is finalised by a portfolio document submission. Our Change Project involved integrating an ESD module into the HDP.

Integrating ESD into the HDP

The Change Project was undertaken over a period of one year. It involved developing an initial Change Project plan, reviewing the plan with international input and feedback, and integrating the concept of Education for Sustainable Development into the HDP. Following this, a course module with integrated sustainability concepts was prepared by adapting the existing course module from the Education Faculty of the Haramaya University.

During the process of the project development and implementation, we acquired a variety of skills, concepts and values on the issue of environment and sustainability through international, national and local training, seminars and workshops. Furthermore, the DDU College of Social Science and Humanities has potential staff members and commitment to bring about the desired change in the specific area of sustainability and environment.

Goals and objectives

The main goal of the Change Project was to integrate sustainability concepts into the HDP at Dire Dawa University, which will potentially gradually develop into a self-sustaining programme in the university. Thereby ensuring that sustainability concepts and environmental issues are addressed in the different course disciplines delivered to students.

The project set out to accomplish the following objectives:

- to embed the broader dimensions of the mainstreaming of environment and sustainability issues in the university's syllabuses through the integration of ESD into HDP;
- to acquaint the trainees with the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment through inculcating the ESD contents into HDP;
- to develop a set of values and attitudes of concern in students for the environment and the motivation to actively participate in environmental improvement and protection;

- to provide the community with a variety of experiences and basic understanding of the environment and its associated problems; and
- to support the re-orientation of educational systems towards mainstreaming the sustainability and development issues in Dire Dawa University.

Phases of implementation

This section describes the various phases and action-orientated activities that were undertaken in the implementation stage of the Change Project.

Preliminary assessment of the HDP Module

The HDP module, implemented in 2003 in all Ethiopian Universities, is continuously being changed and improved, with national consensus of the HDP coordinators and under the auspices of the Ministry of Education, with special consideration to include contemporary issues like environmental and social issues. Hence, assessing the existing modules of the HDP was found crucial before developing the module. The HDP module document was extensive in content and methods focus on active learning methods, reflective teaching, action research, continuous assessment and, more recently, gender issues in higher Education modules. However, there was no part of the training module that deals with sustainability and environmental issues. Moreover, it appeared that universities are allowed to incorporate global, national or local concerns as per their sensitivity. Hence, there was a room to integrate ESD and sustainability issues into the HDP module at the Dire Dawa University.

ESD Module development

After assessing the existing module of the HDP, possible gaps were identified that the ESD module could fill. We then adapted the module informed by the ESD module from Haramaya University and UNEP documents and made it available and accessible to the trainees. In addition to the module, we developed a training manual to assist the trainers and the coordinators. The manual was also important for the induction programme, as more than fifty new academic staff members are employed every year. So, as later candidates of the HDP, all the newly employed staff would get an initial one-week introduction to the concept of ESD (for at least four hours) in the annual induction programme of the university.

The training module contains the global concern of ESD at all levels of education, particularly at tertiary level placing sustainable development at the centre of their teaching, learning, research and management processes. The training module also explains the close relationship that exists between the health of our ecosystems and the well-being of its people. Moreover, it emphasises the push for ESD as the re-orientation of education at all levels (including universities) towards sustainable development. Furthermore, the module encompasses the promotion of values and ethics through education at different levels, in order to make an impact on people's lifestyles and behaviour and help to build a sustainable future. More importantly, it highlights skills and methodologies to address ESD issues and relate them to daily lessons of teaching and learning processes. The importance of focusing on institutional capacity development for implementation of ESD and strengthening interactions with actors outside the university is another crucial issue that has been considered in the module content.

Pre-sensitisations and advocacy

As part of the third phase of the Change Project, the project participants met and discussed with university's top level managers: the President and the Vice Presidents; middle level managers: Quality Enhancement and Academic Programme (QEAP) Directorate Director, Deans and Vice Deans of Faculties, HDP leaders and coordinators; and the lower level managers: Department Heads and committee chairpersons. The discussion

was about the Dire Dawa University's Change Project concept (i.e. integrating ESD into HDP), including its objectives, implementation strategies and the process of formal approval of the project. Most of the discussions were held during workshops and frequent meetings. We advocated ESD as an important tool for understanding root causes of unsustainable outcomes in social, environmental, cultural and economic ventures of development, which would in turn lead to poverty and underdevelopment. We created an awareness of social responsibility and consciousness of individual actions required at all levels in order to achieve nationwide MDGs.

In addition to presenting the concept of ESD and the DDU's Change Project to the HDP council (Deans and Vice Deans with QEAP Director as Chairperson), there were frequent discussions with ESD coordinators and Faculty management body on how to better implement the prepared ESD draft module. Initially, there was a little resistance to add onto the existing module, which had been approved by the Ministry of Education. However, with the guidance of the QEAP Director, we reached a consensus to reduce some parts of the ESD module contents and revise, as per the schedule of the HDP training, which is prepared and approved by the Senate every year. The QEAP, HDP leaders and coordinators, Deans and Vice Deans were pursued and convinced to accept the proposed ESD module to be integrated into the HDP, given the incorporation of their feedback into the materials.

Public sensitisations

To concretise the focus of our ESD curriculum development work, we decided to support an Earth day activity involving the university and community. Earth day was the most important event to introduce the issues of sustainability to the public through various ways. Earth day was celebrated over two days in the university and in town, under the guidance and coordination of the Faculty of Social Sciences and Humanity and the Department of Geography and Environmental Studies. Activities ranged from distributing leaflets and brochures in the university compound and in town, to a marching band accompanied ten kilometer walk. The event ended with a panel discussion with university staff and higher officials, experts from the Environment Protection Authority, community leaders, factory owners and managers chaired by the Vice President for Academic and Research Affairs of the university. We took advantage of the opportunity and promoted ESD as much as possible by printing t-shirts, brochures, singing songs of protection, rehabilitation and safety of the earth accompanied by high profile marching band of the city, and finally wrapped up by an extensive planting of trees together with stakeholders. During the walk, a boy (around 12-15 year old) came running to me and said "Hey sir, what happened to the earth?" I replied "The earth is dying", and he asked again "so what are you saying?" "We are killing it and we, including me and you, have to save it". Then we chatted for the duration of the walk during which I told him some concrete issues of sustainability and development in simple language. Before he departed the boy said "I will join this university after a few years and study about environment or what you said earlier, you will see Mr Gate keeper". We talked in a local language. I felt like I trained him for a year.

Approval and official acceptance

The Change Project needed official recognition and approval by the university's governing body. Hence, after developing the module and advocating to the university's management and staff, it had to pass through all levels of endorsement and official approval. The integration was approved subsequently at department, college and HDP Council levels. After the Council's consent, it was approved by the university Senate, which the highest decision making body of the university.

Module integration

The developed ESD module has been integrated alongside the other existing modules of the HDP, as shown in Table 1. The training guide of the ESD module was added to the last part of the HDP document, just before their final practical attachment work. We chose the end of the training schedule in order to have the opportunity of extended contact with the trainees, as they have about three months of free time before

practical attachment. We had to reduce the module to more practical activities in which the trainees were given more activities to be done and discussed regarding sustainability and environmental issues.

Table 1: The ESD module integrated into HDP modules

Number of Modules	Name of Module	Sessions	Hours
Module 1.	The Reflective Teacher	10	16
Module 2.	Developing Active Learning	8	16
Module 3.	Action research : Making a Difference	10	20
Module 4.	Improving Assessment	7	16
Module 5.	Gender Issues in Higher Education	5	16
Module 6.	ESD	8	16
Total		48	100

Module implementation

The initial training was conducted in June 2014. However, the schedule was only half of the planned length of time (four weeks of 16 hours in 8 sessions) due to the reason explained below in the challenge and constraint section. We trained fifty HDP trainees, including the four HDP coordinators and leaders as per the guideline integrated into the HDP module. The full training will commence next year with the formal academic schedule approved by the Senate of the university.

Implementation evaluation

Content, objectives, schedule, time and delivery strategy were evaluated by the trainees. They were all positively impressed on the necessity of the objectives and delivery of programme as it addresses the global, national and local concerns about the environment and sustainable development issues. However, they reported that the content was bulky and time was limited and that this requires some consideration. Moreover, they commented on the lack of follow up mechanism in order to ensure sustainability outcomes of the programme.

Outcomes of the project and their significance

There were a number of significant outcomes produced as a result of the implementation of our Change Project.

Action oriented ESD module embedded in the modules of the HDP

We have put forth maximum effort to integrate environmental education and sustainability issues into existing courses and curriculum of the HDP of the university. According to our observation and analysis, no

department had included sustainability issues into their course syllabus and daily teaching learning planning. This created the initiation to develop a Change Project proposal to integrate ESD with the HDP, so as to equip instructors with sustainability concepts, which, in turn, would help instructors to teach the concept to their students while delivering the different subject matters. Now, after implementation of our Change Project, the DDU has a well documented training module for integrating and inculcating the contemporary issues and concerns of ESD.

Awareness created

A variety of activities were undertaken to integrate ESD to the HDP. In the process, not only was the training formalised as an embedded programme, but a broad awareness was also created both in the university and in the surrounding community. In trying to get the attention of the concerned bodies for the integration, a lot of ESD-related awareness raising activities has taken place through training, workshop, celebrations, and brochures. As a result, community leaders and members, factory owners and managers, government officials from different sectors and university staff members have created awareness on the concept of sustainability and environment issues in the framework of ESD. Consequently, the Change Project received full acceptance and support from the university management and other stakeholders.

Network and linkages created

As a consequence of the ESD-HDP integration process and implementation, a number of long lasting and meaningful linkages and networks have been created with environment related government organisations and non-government organisations. For example, the National Cement Factory and Ture Cement Factory, Dire Dawa Food Complex SC, Environment Protection Bureau and other organisations together donated over 5 000 US dollars during the events of ESD-Earth Day celebration.

Challenges and Constraints

The following challenges and constraints were identified during the process of implementation.

Training schedule mismatch

The HDP schedule is prepared at the beginning of the Ethiopian calendar year. Nevertheless, the ESD project schedule was introduced after the training had started. Due to this, it was difficult to commence the ESD module training, which was scheduled for the month of May 2014, and the scheduled one-month ESD training was pushed back to the first two weeks of June 2014, due to the inconvenience created for trainees.

Inconveniences for top- level managers of the university

The top level mangers (President and Vice Presidents) were rarely available for pre-programmed workshops and meetings due to their busy schedules. As a result, the workshops planned were frequently postponed. This affected the pace of implementation several times.

Per diem request for initial training

The trainees are normally exempted from six hours of normal workload per week for the HDP training programme. When the ESD module was first introduced as an additional training module that required four hours per week for a month, the trainees requested more exemption or payment as compensation for their additional commitment and time.

Conclusion

In reaction to the results of the analysis conducted on the status of ESD in DDU, the project idea was conceived to tackle the problem in the framework of the International Training Programme (ITP). During the implementation of the project, we executed several steps including ESD module development, pre-sensitisation and advocacy, public-sensitisation, approval of the project, ESD module integration into existing HDP training document, implementation and evaluation of module implementation. Consequently, action-oriented ESD training module and manual were implanted into the HDP training document of the university, ESD concept and skills were delivered, and network and linkages have been created with various national and local institutions.

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Chapter 20: Embedding ESD Concepts In The Curriculum Of The University Of Zambia: A Change Project And Beyond

Douty Chibamba and Enock Sakala

(University of Zambia, Zambia)

Abstract

The main aim of our research was to explore opportunities for introducing ESD concepts in a postgraduate programme (MSc in Environmental and Natural Resources Management) that was launched in July 2012 in the Department of Geography and Environmental Studies (DGES) at the University of Zambia. We developed three new courses for possible inclusion in the programme, of which one was incorporated and has proved to be very popular with students. A comprehensive needs assessment with relevant stakeholders was conducted prior to the launch of the programme while the implementation of the change project was preceded by a departmental audit using the Unit-based Sustainability Assessment Tool (USAT). The results indicate that there is general support for the embedding of ESD concepts in the curriculum, but there is considerable resistance from some members of staff. The general opinion is that issues of ESD are already being taught in many existing courses. There is also an argument that issues of ESD should be left with the School of Education not the School of Natural Sciences, where the DGES is housed. ESD is viewed mainly in terms of pedagogy rather than curriculum content. In other words, the school that trains teachers in 'how to teach' is better placed to pursue issues of ESD than a department (like DGES) that teaches them 'the content' they should teach. It is quite a contradictory state of affairs.

Introduction

The major goal of the United Nation's Decade of Education for Sustainable Development (UN DESD, 2005-2014) was to integrate Education for Sustainable Development (ESD) into all levels of education (United Nations, 2011). Consequently, there is a plethora of literature that states that current economic development trends are not sustainable and that ESD is key to moving society towards sustainability (e.g. Lambrechtsa and Liedekerke, 2014; Adomßent et al., 2014; Kopnina, 2014; Holm et al., 2014; Lampa et al., 2013; Lee et al., 2013; Little and Green 2009; Blum 2008; and Jones et al., 2008). In fact, the burden or expectation of training *ecologically literate graduates* (Gombert-Courvoisier, 2014; Diemont et al., 2010) through ESD has been disproportionately placed on higher institutions of learning, particularly the university, in recent years (e.g. Jankowska et al., 2014; Koscielniak, 2014; Holm et al., 2014; Karatzoglou, 2013; Jabbour et al., 2013; Jones et al., 2008). The emphasis on the university is premised on the assumption that graduates from higher institutions of learning have a greater ability to use their acquired skills in a manner that takes into account the social, economic and environmental benefits and drawbacks. In other words, university graduates trained in ESD are capable of choosing best actions that consider current and future generations in resource utilisation. This is an urgent matter given the claim by Wackernagel at al. (2002) that humanity is currently running an ecological overshoot of 120 percent, which implies that humanity now requires one and a half earths to regenerate the natural resources we consume and to assimilate the waste that we generate each year.

At the core of ESD is the idea of achieving the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 8). This entails that

we are encouraged to hand down to the future generations no less affluence than we are enjoying today. This touches on considerations of intra- and inter-generational equity and justice. In suggesting a strong sustainability criterion, Rees and Wackernagel (1996, p. 225) argue that "each generation should inherit an adequate per capita stock of natural capital assets no less than the stock of such assets inherited by the previous generation". They clarify that natural capital assets do not only include material resources, such as minerals and forests, but also process resources, such as waste assimilation, photosynthesis and soil formation. They further suggest that the depletion of non-renewable resources could be compensated for through investment in renewable natural capital.

The United Nations (2011) and Kitamura (2014) suggest that sustainable development is defined by activities that endeavour to create a fair, just and affluent future by building peace, fighting global warming, reducing north/south inequalities, fighting poverty, fighting the marginalisation of women and girls, preventing disasters, and promoting corporate responsibility, among others. All these activities can only thrive in democratic social systems that guarantee freedom of speech and expression and in which everyone can participate in decision making. In such societies, governance and development systems do consider environmental and social impacts of development activities while respecting the uniqueness of individuals (Kitamura, 2014).

This study was an attempt to infuse sustainability concepts into the curriculum of the postgraduate programme (MSc in Environmental and Natural Resources Management) that was launched in July 2012 in the Department of Geography and Environmental Studies at the University of Zambia. It is premised on the activities that were undertaken for the Swedish International Development Cooperation Agency (SIDA) International Training Programme (ITP) for developing a Change Project that began in 2011. The curriculum Change Project started prior to the launch of the MSc in Environmental and Natural Resources Management Programme, and thus provided a rare window of opportunity to try and infuse ESD concepts into the curriculum of the University of Zambia.

National and institutional context of ESD in Zambia

The national policy on education in Zambia, *Educating Our Future* (GRZ, 1996), does not make explicit reference to ESD and how it could be implemented in the country's institutions of learning. However, one of the goals that the Ministry of Education has set for itself is to produce "a learner capable of […] participating in the preservation of the ecosystems in one's immediate and distant environments" (GRZ, 1996, p. 6). Almost a decade later, around 2004, this goal was somewhat realised by the Curriculum Development Centre's (CDC) launch of the revised geography syllabus for high schools, which included a compulsory geography project. The project provides pupils with an opportunity to investigate a wide range of environmental problems, such as water and air pollution, deforestation, and solid waste management. Given that geography is not a compulsory subject at high school, some pupils miss this opportunity.

At the University of Zambia (UNZA), existing policy frameworks, which set the stage for ESD innovations, follow Zambia's first long-term plan called *Vision 2030.* This plan articulates the following key principles: sustainable development; upholding democratic principles; respect for human rights; fostering family values; a positive attitude to work; peaceful coexistence; and upholding good traditional values (GRZ, 2006, p. v). The sector vision for environment and natural resources is "a productive environment and well conserved natural resources for sustainable socioeconomic development" (GRZ, 2006, p. 35). All these principles form essential building blocks for achieving sustainable development.

Following the guidelines provided by *Vision 2030,* UNZA has identified the paucity of qualified Zambian personnel in ESD as the greatest sustainability challenge that needs to be addressed urgently. In this regard, the institution has initiated various educational innovations including a BEd in Environmental Education programme; a BA(Ed) in Zambian Cultures and Ceremonies programme (newly approved); a MEd in Environmental Education programme; a MSc in Sustainable Development in Mining in Africa (proposed); a SADC Regional Training Programme in Teacher Environmental and Sustainability Education (newly

approved); a MSc in Environmental and Natural Resources Management; and a MSc in Spatial Planning (launched in July 2012 and October 2013, respectively, in the Department of Geography and Environmental Studies).

The key focus of these programmes is to contribute to quality human resource development in ESD in Zambia. Target beneficiaries are pre-service and in-service candidates from a cross-section of institutions, such as government, non-governmental organisations, industry and civil society groups. The coverage of the programmes is at various levels, such as intra-institutional, community, national, regional, and international levels.

Developing the curriculum: Master of Science in Environmental and Natural Resources Management

Prior to the development of the proposed MSc in Environmental and Natural Resources Management Programme, a comprehensive consultation with various stakeholders was undertaken (2009-2011) to elicit their input into the programme. The stakeholders who were consulted included the Ministry of Tourism, Environment and Natural Resources, the Zambia Wildlife Authority (ZAWA), the Forestry Department, and the Zambia Environmental Management Agency (ZEMA). These stakeholders offered valuable input that helped to enrich the programme tremendously. A sizeable number of graduates from the DGES are employed by these stakeholders.

Alongside the stakeholder consultation process, a departmental audit of the Department of Geography and Environmental Studies was undertaken using the USAT tool. Informal and formal meetings were held with colleagues in the department to discuss the concept of sustainability and seek ways of incorporating it into the existing curricula. The audit revealed that, generally, efforts to integrate environmental education or sustainability into existing courses were patchy and poorly networked and/or connected. In some cases, existing courses have been repackaged and the word *environment* has been substituted by the words *sustainable development*.

Implementing the Change Project in the department

The main objective of our Change Project was to develop and incorporate ESD concepts in at least three courses for the proposed MSc in Environmental and Natural Resources Management Programme (launched in July 2012) to be offered by the Department of Geography and Environmental Studies, School of Natural Sciences. However, this attempt was met with some resistance from departmental members. Many members argued that they are already teaching sustainability, particularly at undergraduate level, in courses such as climatology and, environment and development. They felt that there was no need of 'repeating' teaching sustainability issues at postgraduate level. With much perseverance, we did manage to develop a new course, named *climate change and sustainable development*, which was incorporated into the new programme as an elective. We could not push for the inclusion of the other two courses, *poverty and development*, and *geographies of globalisation*, given the initial resistance to incorporate climate change and sustainable development alone. Müller-Christ (2014) advises to start with an additional elective course when attempting to incorporate sustainability concepts into an existing curriculum. This is because integrating ESD concepts into all core courses of any study programme is a more difficult route to take, as it would require changing the examination regulations over a long period of time (Müller-Christ, 2014).

Climate change and sustainable development course

Apart from the scientific background of climate change, the new climate change and sustainable development course endeavours to discuss how climate change, sustainable development and poverty reduction are

mutually reinforcing and structurally linked, such that failure in one is most likely to undermine the other two. Others issues tackled in the course are how developed countries have used a disproportionate share of the *carbon space* (also known as *development space*), which developing countries now badly need to meet their primary goal of poverty alleviation. This issue is discussed in relation to the possible difficulty it will present in trying to agree on a legally binding climate change framework in 2015 that places heavy carbon cuts on both developed and developing countries. All these issues are key foundations for the path to sustainability. The course has proved to be very popular in that it has been offered consecutively during the past two academic years that the programme has been on offer, with an average intake of six students out of the ten that register for the programme each year. Other academic members of staff have shown interest in it and have participated in teaching the course, during the last academic year (2013/2014).

Opportunities beyond the Change Project

The inclusion of the new course, climate change and sustainable development, into the MSc in Environmental and Natural Resources Management programme provided us with the impetus to seek other opportunities for moving the ESD agenda forward in the department beyond the Change Project. Indeed, a few opportunities were available and we made use of them.

Geography Field Course

We are making deliberate efforts to embed ESD concepts into some courses at undergraduate level using the skills we acquired from the implementation of our Change Project. One such course is GES 3433 (Geography Field Course), which is compulsory to all the third year students that take courses in our department. This is a research course that runs throughout the year. Students develop research proposals on a topic and study site selected by the members of staff in the department during the first half of the year. The research is then conducted during the mid-year break over a one-month period. The theme for this year's research was *human settlements and environmental sustainability* and it was undertaken in Zambia's small southern resort town of Siavonga from April to May 2014.

Students are required to submit four pieces of work: a field notebook, a human project report, a physical project report, and an integrated essay. The title for the human project was *planning prospects for sustainable housing, water and sanitation in Siavonga,* while the physical project was titled *environmental changes: nature, causes, effects and mitigation measures in Lusitu*. Lusitu is a rural community about 58 kilometers north of Siavonga where the Gwembe Tonga people were relocated to pave way for the construction of the Kariba Dam. The area has experienced serious environmental degradation with massive deforestation, gully erosion and drying up of the Lusitu River, once a perennial river but now an ephemeral one. The theme and topics for the human and physical projects are carefully selected to provide us with a leverage to infuse sustainability concepts without the need to negotiate with other members of staff in the department, save for those on the field course team for that particular year. This year's field course excursion was coordinated by one of us, who participated in the ITP. He continues the coordination for the next academic year, giving us another opportunity to infuse even more ESD concepts into this particular course. Examining the condition of housing, water and sanitation in Siavonga is a sustainability agenda, so is investigating the nature and causes of environmental changes in Lusitu. In both studies, the environmental challenges faced by the communities were examined in detail and possible solutions suggested by the students. Students had the opportunity to directly interact with both the people and the environment in trying to understand the problem and how it can be resolved. We believe this is one way we can offer lifelong skills that are demanded of ESD graduates from higher institutions of learning.

MSc in Spatial Planning

In October 2013, the Department of Geography and Environmental Studies (DGES) launched the MSc in Spatial Planning programme, a collaborative effort among various stakeholders, including the University of Zambia (through the DGES), the Ministry of Local Government and Housing, the African Association of Planning Schools (AAPS), and the Peoples Process on Housing and Poverty in Zambia (PPHPZ). Prior to the

launch, the AAPS had undertaken comprehensive studies in order to argue to re-orient planning curriculum in Africa from theory- to practice-based and from north- to south-oriented. To this effect, Duminy (2010, p. 25) argues that "curricular development should therefore avoid northern-oriented paradigms to engage, in a highly pragmatic and contextualised manner, with the real conditions and demands of African developmental processes". He further notes that,

> postgraduate planning education should be based on a pedagogy that emphasises intensive, integrated theoretical and practical training via practice-based projects that necessitate student engagement with real-world planning problems, and the formulation of innovative and creative responses. This requires a shift from lecture-type, unidirectional instruction towards practice-based and 'discussion teaching' approaches that promote 'experiential' and 'problem-based learning' using case studies (Duminy, 2010, p. 25).

In the history of the DGES, this is the first time it has offered a course dealing with real-world problems to the extent that the MSc in Spatial Planning does. The programme has intensive fieldwork, which takes about sixty percent of the students study time and is spent in a studio. The students have a studio for each stage of their studies. For example, a local studio deals with a squatter upgrading process; a city wide studio could seek to provide a spatial development framework for an entire city or a part of it; a regional studio seeks to provide a spatial development framework for a region, such as between districts or provinces. Sustainability is the key theme in each one of these studios and working in groups and engaging with the local communities and other stakeholders is a must. Most of the courses in the programme hover around the concept of sustainability and how to attain it. One of the members who attended the ITP is currently coordinating this programme, providing another opportunity to entrench ESD concepts in the departmental curriculum. Indeed the ITP has provided opportunities beyond the Change Project to incorporate sustainability concepts into the curriculum.

Conclusion

We managed to infuse ESD concepts in the MSc in Environmental and Natural Resources Management Programme that was launched in July 2012 through an elective course entitled *Climate change and sustainable development*, which has since proved to be quite popular among students. This was a great success for our Change Project. Although not all the electives we envisaged have been taken on board, the sustainability concepts inherent in them will be incorporated into some existing undergraduate and postgraduate courses. This calls for innovativeness on our part as participants in the ITP using the skills gained therein. One of the barriers of integrating ESD into existing curricula in the department, as explained above, is that many colleagues in the department feel that sustainability is already being taught in so many other existing courses. Particularly, ESD is seen as belonging to the School of Education, which trains teachers 'how to teach' and not the DGES, which provides the teachers with the content they ought to teach. This argument is highly contradictory in that it is the DGES that has a better opportunity to teach content rich in ESD concepts, so that the School of Education only needs to orient the teachers on how to deliver that content. However, GES 3433 and the MSc in Spatial Planning provide us with a window of opportunity to entrench ESD concepts into the departmental curriculum with almost no resistance from other members of the department. What started as a one-year Change Project (2011) has now given us an opportunity to impart sustainability skills on our students forever.

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Chapter 21: Reorienting Teaching Strategies For Pre-Service Science Teachers Using ESD In Mbarara University Of Science And Technology, Uganda

Basil Tibanyendera

(Mbarara University of Science and Technology, Uganda)

Abstract

The Change Project was conceived after realising that despite the many years of formal education, Africa continues to experience many sustainable development challenges in the dimensions of environment, economy and society, which include environmental degradation, poverty, disease burden, and conflicts, among many others. Our Change Project, entitled *Reorienting teaching strategies for Mbarara University of Science and Technology pre-service science and mathematics teachers towards Education for Sustainable Development,* is based on the premise that Education for Sustainable Development (ESD) aims to empower citizens to act for positive environmental and social change, implying a participatory and action-oriented approach. It entails rethinking and retooling of teaching strategies to equip pre-service teacher trainees with teaching strategies and mindsets for actualising ESD; mainstream environmental education in the curriculum; integrate socioeconomic perspectives in teaching; engage staff more community engagement, especially through action research; and develop self-concept as a change agent to bring about sustainable development. The Change Project innovation is based in the Faculty of Science in the Mbarara University of Sciences and Technology and involves lecturers of teaching methods and pre-service teacher trainees of the Bachelor of Science with Education. The retooled teaching methods should encourage more interaction among teachers, learners, and communities towards sustainable development. The anticipated outputs of the innovation include more community sensitisation about sustainable development issues, social justice, harmonious coexistence, sustainable life styles, environmental ethics, and sustainable production, among others, which all emanate from systemic Education for Sustainable Development.

Introduction

This Change Project was developed on the premise that the present teaching methods in Uganda's secondary schools generally lack the element of integrating learning experiences into the day-to-day personal and professional lives of individuals at various levels. What is urgently needed is the infusion of sustainable development thinking in the teaching-learning activities at the different levels of education, especially at the teacher-training level. This calls for integration of Education for Sustainable Development (ESD) concepts into the subject content as well as the pedagogical approaches.

Interaction between the university and communities, and application of the acquired knowledge and skills to benefit communities is one of the university's tenets. Indeed, the intrinsic value of ESD is enshrined in the university's philosophy and mission. The Change Project was implemented in the Department of Educational Foundations and Psychology in the Faculty of Science of the Mbarara University of Science and Technology (MUST). The project involved lecturers of specific subject methods and pre-service science teachers in the same Faculty.

Like in many other educational institutions, the instruction of pre-service teachers is dominated by teacher-centred methods. These methods tend to create a gap between the taught knowledge in secondary schools and community development needs. Consequently, the desired development in the communities does not occur. Therefore, the major aim of the Change Project was to reorient the commonly used teaching methods for pre-service teacher training, such that the teacher trainees perceive themselves as change agents and conduits of sustainable development.

The proposed retooled teaching methods are aimed at facilitating secondary school teachers, who graduate from MUST, to engage their learners in activities that bring them closer to community needs by using methods that encourage critical thinking and problem-solving approaches. The retooled teaching strategies are significantly different from the commonly used methods, which tend to stress the quantity of the delivered content, rather than the quality, relevance and ultimate goal of causing development in the communities. The uniqueness of the proposed retooled teaching methods is the personal involvement of both teachers and learners in the teaching and learning processes. This involvement requires knowledge and comprehension as well as individual and collective commitment to ecological and human care. Preferred methodologies should be those that promote interdisciplinary learning; develop skills of analysis and problem-solving; promote learner participation; and stimulate and facilitate action, based on a change of behaviour and attitude in the long run towards sustainability and sustainable development (Ketlhoilwe, 2008). The project is based on the overall aim of ESD to empower citizens to create a positive environment and social change, implying a participatory and action-oriented approach.

The main focus of the Change Project

At its inception, the envisioned Change Project set out to focus on eight key aspects, as described below.

- Engaging and sensitising university management towards the realisation of mainstreaming ESD in all training in the university; and to perceive their efforts as contributing to the same goal.
- Creating awareness among the lecturers about ESD and their role in achieving the goals of mainstreaming sustainability issues in the university curricula.
- Identifying indicators of sustainable development within the university.
- Developing modules and training materials for management and academic staff.
- Mainstreaming environmental education in the university curricula programmes.
- Conducting research in community development needs and problems (through Situational Analysis Studies).
- Networking with stakeholders, promoters and beneficiaries of ESD.
- Identifying and designing learner-centred and community-oriented strategies for pre-service science teachers of MUST, which would make it easy for them to translate theory into practice, and to teach their students in service of development needs of the communities.

This chapter focuses on this last aspect of reorienting teacher strategies for pre-service science teachers.

Specific objectives of the Change Project

At the end of the teaching methods course, the undergraduate teacher trainees should be able to involve learners in identifying sustainable and unsustainable practices in their communities in relation to specific subject content areas, and to design and apply innovative teaching approaches that enhance principles and values of sustainable development. They should also be able to assist schools to develop environmental management plans, and to participate in the implementation of those plans; develop teaching materials in conformity with ESD principles, such as fact sheets and teachers' guides, to aid teaching and learning processes within their specific subject content areas; and develop awareness about the interrelatedness of environmental and sustainability issues, such as climate change, corporate responsibility, poverty, HIV/AIDS, and equity, which take on environmental, economic and socio-cultural perspectives.

The Change Project process

The Change Project went through five main stages. In phase I, an institutional audit was undertaken using the standardised Unit-Based Sustainability Assessment Tool (USAT). The participants in this survey were members of the university management team, lecturers in indifferent faculties and departments within the university, and pre-service teacher trainees. From the institutional audit a number of gaps emerged in respect to teaching aspects, research, community engagement and university management operations. Phase II involved discussions with Heads of academic Departments concerned with the training of pre-service science teachers at MUST. The issues that were discussed included the use of practical approaches to teaching, using examples relevant to local conditions that will enable school products to practise what they learn. This entails teaching with a view of knowledge application to meet community needs and practices as well as teaching towards research. This calls for creativity, innovation and critical thinking in teaching, improvisation and harnessing of the local environment.

Phase III included an institutional workshop. The cardinal objectives of the workshop were to create awareness about MESA partnerships among Mbarara University staff and students; to locate the proposed Change Project in the university context; to build a network of support; and to strengthen the institutional commitment to sustainability concerns. It was attended by MUST members of management and academic staff, and students' representatives. The keynote address at the conference was delivered by Professor Gitile Naituli, who spoke about *Strengthening Capacity to Act: MESA Universities partnerships*. The institutional workshop acted as an eye opener on the need to integrate ESD in teaching, research and community engagement in higher education, among others.

Phase IV was the participation in the ESD International Training Programme in Sweden and South Africa. Lastly, phase V entailed the implementation of the Change Project with effect from August 2008. A workshop was organised for the lecturers of subject methods to introduce them to the proposed retooling of the teaching strategies. The lecturers were then tasked with the duty of teaching these retooled teaching methods to the teacher trainees, which they still teach.

Retooling teaching strategies for pre-service science teachers

The conventional teaching methods that need retooling towards sustainability teaching include: the lecture method, demonstration, experimentation, group work and discussion methods, among others (Farrant, 1980; Petty, 1998). What is needed here is to reorient the teaching methods in such a way that sustainability issues can easily be integrated in the teaching, and that the learning becomes more hands–on rather than merely theoretical. Learner-centred education is more favoured in pedagogical discourses (cf. Capel, Leask & Turner, 2001), as it acknowledges that learners can bring into the learning situation a wealth of knowledge and social experiences gained from interaction with the environment and the community. Furthermore, linkage with the local community may enable students to appreciate the significance of sustainable development locally and internationally.

The reoriented teaching strategies should focus more on facilitating teacher trainees to:

- make teaching schedules through project work;
- articulate the teaching-learning activities from introduction of the concept to be taught;
- harness learners' knowledge and experiences;
- use audio-visual materials to illustrate concept knowledge;
- draw conclusions based on critical refection; and
- link the new knowledge to sustainability considerations.

Many teachers of Mathematics argue that teaching aids for some mathematic topics are hard to come by, or even state that such aids cannot be found. This is mainly reported in the area of Pure Mathematics at high school level, such as for the topic of Integration Theory. In such circumstances, the teachers simply stick to the textbooks, which generally lack reference to the concepts relevant to local applications, thus making such concepts too abstract and less accessible to students. This is a bad trend given that Mathematics is the language of science, and science is the vehicle for achieving sustainable development. The Change Project aimed at changing teaching approaches so that problems, as pointed out above, are minimised by re-orienting teacher training so that they realise the need of ESD, and actually make the necessary preparations for their lessons to achieve the intended goals. When this is achieved, we will be on our way to achieving an Education for Sustainable Development.

Central to the teaching strategies is a deliberate effort to integrate indigenous knowledge in the teaching of new knowledge, skills and value systems. Many concepts in modern learning are grounded in indigenous knowledge, whereby learners already possess prerequisite knowledge. This greatly facilitates understanding and challenges the hegemony of one dominant way of knowing the world. Integrating indigenous knowledge in teaching, not only enhances sustainability thinking and practice, but also captivates learners' interest and strengthens the principle of learning from the known to the unknown. The following sections describe some of the proposed teaching strategies and how they can be used to integrate ESD issues.

Example of a case study approach in science education

Presented here is an example of how a topic, such as *Integration*, could be taught using a case study approach. A case study approach helps learners to link the theory of Integration to local application, thus encouraging them to appreciate and learn the concept of Integration.

Infusing environmental and sustainability issues
A teacher could integrate elements of environmental and sustainability concerns in the lessons by developing a case study, such as the one presented below.

Consider Figure 1, in which a river runs through a village and near a trading centre, taken as the reference point or the origin at point (0,0).
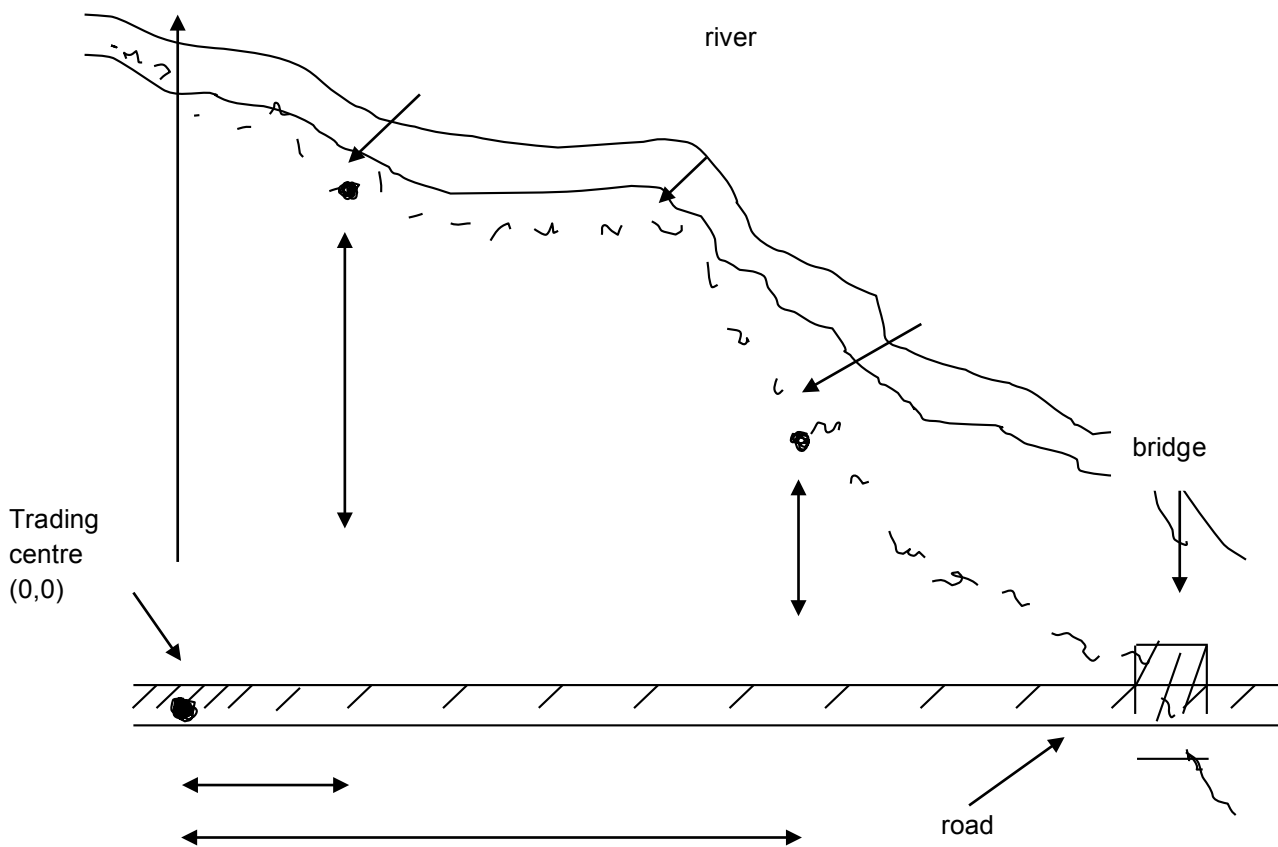
Figure 1

Different points on the river are at different distances from the reference point. To get to point A from the trading centre, move distance x_1 in positive east direction and distance y_1 in positive north direction. To get to point B from the trading centre, move distance x_2 in positive east direction and distance y_2 in positive north direction. Thus, points A and B can be represented by coordinates (x_1, y_1) and (x_2, y_2), respectively. Distances x and y may be connected by a formula (refer to construction of equation of a line), such as $y = x^3 - 2x + 4$. The land between the road and the river right from the trading centre up to the bridge has been earmarked by the village's cooperative society to establish a flower farm.

Thus, the following questions may be asked:

- Why do you think this land is being earmarked for this project?
- What are the likely economic benefits of the project?
- What are the likely environmental impacts of this project?
- What is the area of the land right from the trading centre up to the bridge, enclosed between the road and the river?
- If digging along the river line is causing some levels of environmental degradation in terms of soil erosion or chemical deposits to the river from herbicides applied to the flower plants, it may be suggested that half of the area for cultivation be sourced from the other side of the road, so as to

minimise on the cultivated land along (or near) the river line. At what distance from the trading centre should the digging end in order to achieve this?

The area of the land right from the trading centre up to the bridge is found by integration under the curve $x^3 - 2x + 4$ where x is the distance from the trading centre to the bridge. That is, the area A is given by

$$A = \int_0^3 (x^3 - 2x + 4)dx = \left[\frac{x^4}{4} - x^2 + 4x \right]_{x=0}^3 = \frac{81}{4} - 9 + 12 = \frac{93}{4} = 23.25$$

With this approach, the teacher is instilling into the minds of the learners the care and value of the environment, as a way of strengthening the incorporation of environmental sustainability issues and creating awareness about ways of minimising environmental degradation. At the same time, the teacher is enabling the learners to appreciate the application of the learnt mathematical knowledge of integration.

Other examples of ESD orientated teaching strategies

Other teaching approaches that can benefit the mainstreaming of ESD into secondary school curricula and which were integrated into the pre-services teaching training, are hands-on teaching or learning by doing method, the project work method, action learning, research, team or group work, and the use of information and communications technology (ICT).

The hands-on teaching or learning by doing method reviews the known teaching methods from a different point of view, by using a work book or a work sheet. For example, teaching about aquatic life in streams and ponds can be done using Share-Net resource materials. A sample of water can be collected from the pond or stream. Using the work sheet, learners are guided in identifying different types of aquatic plant and animal species that can be found in that environment. Their physical characteristics can then be studied, as well as the environmental, social and economic implications in the sustainability of such an ecosystem.

With the second strategy, the project work method, students identify specific problems in the community and design simple, feasible and cost-effective models to address those problems in a sustainably way. The third strategy is action learning (involving learning followed by action), which entails the identification of an issue or a problem in the community by learners in collaboration with the community; and then finding its causes, consequences and action lines. Teachers can make use of the *Action learning planning tool*, proposed by Ketlhoilwe (2008), and the framework for action learning, involving enquiry encounters, information seeking, reporting and action taking (Rosenberg, O'Donoghue & Olvitt, 2008). The fourth strategy that was implemented is to guide learners to engage in research in sustainable development practices and write reports and disseminate their findings.

The fifth strategy is team or group work in which the class is divided into groups and each group identifies a community need or problem. Then, the groups or teams, work on an issue in the content area with guiding questions on the what, how and why. The groups then report back the outcomes of their deliberations to the whole class. Lastly, teachers can make use of ICT, such as computer simulations, e-learning, information sourcing, video shows, TV programmes. In this case sceneries of degraded landscapes, as well as sustainable and unsustainable practices can be demonstrated electronically. ICT remains important as a means of storing and sharing information with partners, in a convenient way and on a regular basis. Computer programmes can be used in quick production of graphics and extrapolations of numerical data, among others.

Other outcomes of the Change Project

Apart from the retooling of teaching strategies, the Change Project had other tangible results. The project has generated an increased awareness in MUST regarding the need to give appropriate attention to sustainability issues alongside community development. In this regard there have been three main outcomes as a direct consequence of implementing the Change Project at MUST. Firstly, environment and sustainable development is now a course unit taught to all students of MUST, under the service course of Development Studies. This is a compulsory service course for all students (including non-teacher trainees).

Secondly, Education for Sustainable Development is now a topic taught to all first year pre-service science and mathematics teacher trainees in the course unit of Historical Development of Education in Uganda. In this topic environmental, economic and social sustainability issues are highlighted. It also emphasises the role of higher education in producing graduates, who will participate in addressing the sustainability challenges locally and globally.

Thirdly, since 2008, at the beginning of every academic year, the Faculty of Medicine organises an orientation programme for all fresh students of the medical sciences. The author of this paper presents in this orientation programme on the topic of Environment, Sustainability and Education. This is acknowledgement that sustainability issues are now taken seriously within MUST.

Conclusion

One characteristic of the Change Project innovation is the anticipated multiplier effect, in the sense that its practice cascades down to the ultimate beneficiaries, i.e. the local communities, for purposes of sustainable development. Its efficiency lies in the fact that it is blended with the existing programmes at no extra cost and engages both staff and students in sustainability issues with an anticipated social and environmental impact and eventual positively changed behaviour and livelihoods of the concerned communities. The innovation follows a participatory approach. Pre-service teachers are empowered to contribute ideas with the vision that they will also involve their prospective learners in the secondary schools. In the long run, the ultimate outcome are empowered citizens, who will act as positive social change agents, respectful of the environmental and social values; conscious of the complex and dynamic environmental, social and economic problems; as well as the desired behavioural change to prepare today's world for tomorrow's generations.

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Chapter 22: Introducing ESD In The School Of The Built Environment At The Copperbelt University

Roy Alexander Chileshe and Gilson Chisomo Ngoma

(Copperbelt University, Zambia)

Abstract

The main aim of our Change Project was to integrate Education for Sustainable Development (ESD) into the curricular of the School of the Built Environment (SBE) at the Copperbelt University in Zambia. The Change Project involved development of a discussion paper on Education for Sustainable Development and Global Citizenship (ESDGC) to engage stakeholders from the SBE in issues of ESD. A combination of the Unit-based Sustainability Assessment Tool (USAT), the Sida International Training Programme process, and institutional workshops were used together with the discussion paper to implement the project. The main changes in the SBE, to which the ESDGC Change Project has contributed, include a review of the school's foundation courses (first year courses) in Sociology, Economics and Physical and Human Geography to include ESD concerns. The SBE has also established a practice office through which it provides leadership and professional skills and competency for academic staff and students to gain practical skills in Architecture, Construction Economics and Management, Real Estate, and Urban and Regional Planning to address practical human habitat challenges. The school also hosts seminars, short duration trainings and public lectures on green construction technologies. The main challenge experienced by the school administration and the ITP participants was dealing with resistance to change, which is common in institutions of higher education.

Introduction

The United Nations has declared 2005-2014 as the Decade of Education in Sustainable Development (UNDESD) and universities in Africa are increasingly accepting the call towards integrating Education for Sustainable Development (ESD) in their curricula. In this chapter, we wish to contribute to the practice of ESD in higher education institutions by exploring experiences of introducing and facilitating an ESD Change Project in the Copperbelt University, School of the Built Environment, which was supported by Sida's International Training Programme (ITP). The chapter is presented in six main parts. The first part explores the national context of the problem as well as the Change Project site: the Copperbelt University, School of the Built Environment. The second part presents the Change Project in relation to the situation prior to the start of the project in the school. The third part describes the Change Project processes, including the ESD audit of the School, production of the project outline and action plan, and development of the ESD discussion paper. The fourth part of the chapter provides the implementation of the Change Project and the fifth part provides the outcomes of the project and their significance. The sixth part discusses the main challenge experienced by the project facilitators and some of the lessons learnt.

National context

Zambia's urban situation has been changing considerably with the discovery of minerals at the turn of the 20th century in the northern part of the country. It is one of the most urbanised countries in Africa with forty per cent of the country's population living in urban areas. This number is estimated to increase to fifty per cent by 2030 and sixty per cent by 2050 (Republic of Zambia, 2011; UNHABITAT, 2013). This trend has created socioeconomic and built environment challenges and draw attention to the need for university to train specialists equipped with the necessary skills to deal with the environment in a human and sustainable way.

The construction industry, one of the largest employers in Zambia, has long proclaimed the need for a steady supply of locally trained built environment professionals. The Copperbelt University (CBU), one of the three public universities in Zambia, aims to provide this need by offering specialised programmes in the School of the Built Environment (CBU, 2010).

The Copperbelt University and the School of the Built Environment

The Copperbelt University (CBU) was established in 1987 and currently has a population of approximately 9 000 students (CBU 2014a). The School of the Built Environment (SBE) is one of the eight schools of the university and is organised in four academic departments, namely Architecture, Construction Economics and Management, Real Estate Studies, and Urban and Regional Planning (see Figure 1).

The school offers specialised five-year undergraduate programmes: Bachelor of Architecture, Bachelor of Science in Urban and Regional Planning, Construction Management, Quantity Surveying and Real Estate.

Figure 1: School of the Built Environment structure and programmes
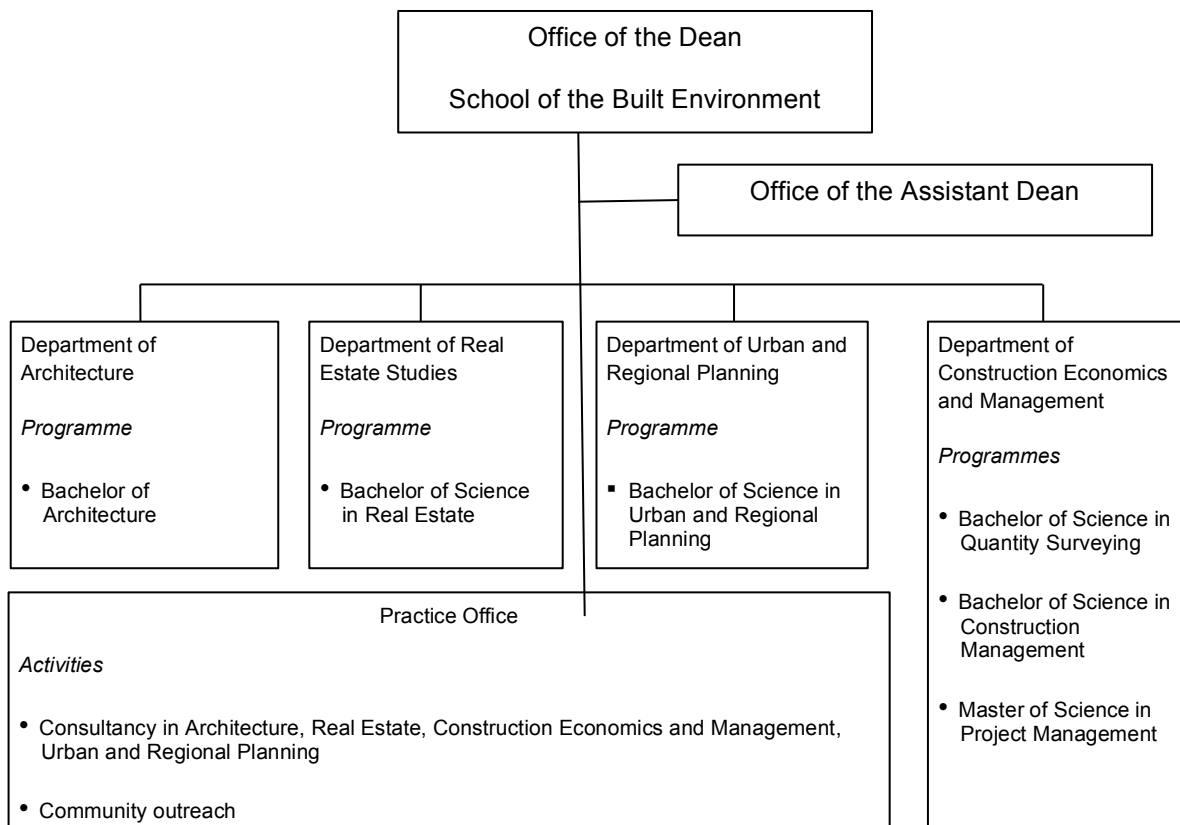
The school also offers postgraduate programmes in project management, training, advisory services and applied research. At the 2014 convocation the school graduated a total of 116 undergraduate students, as shown in Table 1.

Table 1: Number of School of the Built Environment graduates for the academic year 2013-2014

Programme	Male	Female	Total
Architecture	31	7	38
Urban and Regional Planning	11	16	27
Construction Management	8	2	10
Quantity Surveying	19	8	27
Real Estate Studies	9	5	14
Total	**78**	**38**	**116**

Source: CBU 2014b

In addition to the four departments, the school also runs a Practice Office that complements and enriches the theoretical background of academic staff and students by affording them an opportunity to obtain some hands-on experience. The office is registered with the Zambia Institute of Architects and has been involved in community self-help projects, government projects, the CBU, private sector and churches. Through the practice office the school delivers to the construction industry and the community what it teaches (CBU, 2011).

Integrating ESD into the School of the Built Environment

The School of the Built Environment is guided by its vision and mission statements in delivering education to its students. The vision and priority of the School of the Built Environment is to be a leader in human habitat studies in the region, recognised for providing a wide range of teaching, research and scholarly programmes that contribute to the improvement of human habitat and ecological balance (CBU, 2010). A literature review was undertaken to familiarise ourselves with the concept of ESD. This was followed by a sustainability audit of the school. It became clear that some notions of ESD were already part of the SBE programmes. However, after attending phase I of the ITP and gaining further insights on ESD the challenge for the school was to link ESD to the school's vision and mission. Consequently, drawing on ESD literature (e.g. WAG, 2008a; 2008b; UNESCO, 2000, 2005; UNEP, 2006, 2008; Jickling & Wals, 2008; and Bell 2002) a Change Project entitled *Education for Sustainable Development and Global Citizenship in the School of the Built Environment* was proposed and embarked on contributing to the full realisation of the vision and mission of the school.

Audit of the School of the Built Environment

An audit of the School of the Built Environment was undertaken using the Unit-based Sustainability Assessment Tool (USAT). This tool was used to identify departments leading and departments lagging in sustainability as well as detection of the indicators in which they are leading or lagging (Togo & Lotz-Sisitka,

2009). The rating was undertaken by the head of each respective department in the SBE. The rating was based on evidence of the presence of the identified indicators and practices on the following themes: curriculum, teaching approach, research / service and scholarship activities, examination (assessment) of sustainability, and staff expertise and willingness to participate. Heads of Department selected the rating from six choices ranging from X to 4, where X (*do not know*) indicates a lack of information concerning the practice, but not necessarily an absence of such information; 0 (*none*) indicates the absence of information regarding the indicator in question; 1 (*a little*) indicates that the evidence shows poor performance in the concerned indicator and this is about 25% of full information regarding the indicator; 2 (*adequate*) indicates that the evidence shows regular performance, about 50% of full information required by the indicator; 3 (*substantial*) indicates that the evidence shows good performance, about 75% of full information; and 4 (*a great deal*) indicates that the evidence shows excellent performance, more than 75% of full information.

Table 2: School of the Built Environment departmental sustainability rating 2009

Indicator	Arch dept	Urp dept	Cem dept	Res dept	Total (16)	Average	% Rating
Curriculum	3	2	2	2	9	2.3	56.3
Teaching	3	2	3	3	11	2.8	69.8
Research	1	1	1	2	5	1.3	31.3
Examinations	3	3	3	2	11	2.8	69.8
Self Expertise	3	3	3	3	12	3	75
Total out of 20	13	11	12	12			
Average	2.6	2.2	2.4	2.4			
Percentage Rating	65	55	60	60			

Key: Arch = Architecture; Urp = Urban and Regional Planning; Cem = Construction Economics and Management; Res = Real Estate Studies

The results of the SBE sustainability rating in Table 2 shows that the sustainability average score for the departments ranged from 2.6 scored by the Architecture Department to 2.2 scored by the Urban and Regional Planning Department. Among the various indicators, the school was found relatively stronger in the indicators of self expertise and teaching, which performed at 3 and 2.8, respectively, whereas the curriculum indicator performed adequately at 2.3. The least performing indicator was research at 1.3. It was clear that there were

variations in the performance of sustainability indicators across the departments and that the average sustainability performance for the school was just about adequate.

Project outline and action plan

Following the results of the audit, a project outline and action plan were developed for the Change Project. These were informed by insights from the sustainability audit of the school, the shared experiences of the regional ITP coordinators and mentors, and the existing literature on capacity building theories (e.g. Frederick, 2012; Oxfam, 2006; Scott & Gough, 2003; Sterling, 2001; Tilbury, 2002; Osler & Vincent, 2002; and Huckle & Sterling, 1996). The main objective of the Change Project was to introduce and aid integration of Education for Sustainable Development and Global Citizenship (ESDGC) in the School of the Built Environment (WAG, 2008a, 2008b). Consequently, we developed strategies for lecturing staff on how to approach ESDGC in their teaching and ways in which students can be involved in environmental and sustainability issues in their life in and outside the university campus. We aimed to do this, firstly, through providing workshops for academic members of staff and students on ESDGC. Secondly, by undertaking a lifestyle quiz for academic members of staff and students and, thirdly, linking students in the school with other student ESD associations in higher learning institutions, such as the Chalmers University of Technology in Sweden.

Development of the ESDGC discussion paper

To support the project implementation, we decided to develop a discussion paper on Education for Sustainable Development and Global Citizenship (ESDGC). The aim of the discussion paper was to provide support to the School of the Built Environment at the Copperbelt University in planning and implementing programmes that would mainstream environment and sustainability into learning and research. Thus, it was meant to serve as a discussion tool for common understanding of ESDGC among lecturers, students and the school administrators. This product was designed to mainstream environment and sustainability into the curriculum, teaching approach, research / service and scholarship activities, examination (assessment) of sustainability, and staff expertise and willingness to participate. Education for Sustainable Development and Global Citizenship is about the things that we do everyday, the big issues in the world – such as climate change, trade, resource and environmental depletion, human rights, conflict and democracy - and about how they relate to each other and to us (WAG, 2008b). The ESDGC paper argues that within a rapidly changing global context there is a need to embrace this change if we are to remain relevant and the School of the Built Environment graduates are to make a contribution to the quality of life of all living beings in the country and beyond. It is this relevance that will also ensure the sustainability of the university.

The paper explores an understanding of ESDGC, what teaching staff needs to know about ESDGC, and where teaching staff could apply EDSDGC in their professional practice. It also discusses ESDGC in learning and teaching, the values and attitudes linked to ESDGC and the development of skills in ESDGC. The paper was not meant as a manual but rather a discussion document that aims to stimulate interest and provide pointers to information on ESDGC. The paper was expected to stimulate interest in teaching staff, so that they could deepen their understanding of different dimensions of ESDGC and its applications in teaching and learning. In particular, teaching staff were expected to apply their understanding of ESDGC to implement education processes supporting sustainable development. Consequently, the paper was used in workshops to engage staff and students in making suggestions on how to integrate ESD in teaching, research and community service. It was hoped that through the processes of discussion and collaborative interdepartmental initiatives teaching staff and students in the school would have an opportunity to grow in their understanding and application of ESDGC.

Project implementation

Two workshops on ESDGC were conducted, one for the academic members of staff and the other for students. The workshops helped us to share common understanding of ESDGC among lecturers, students and the school administrators. Through the workshops we shared information on transformative learning, curriculum change, innovation in research and community engagement. The Vice Chancellor of the Copperbelt University was invited to open the ESDGC workshop for the academic members of staff and the Dean of the School officiated at the students' workshop. The organisers also invited Professor Gitile Naituli, the regional coordinator of the Sida ITP, to present two papers in support of the workshop. At these workshops the discussion paper *Education for Sustainable Development and Global Citizenship* (ESDGC) *in the School of the Built Environment* was presented. In order to stress the importance of ESDGC in the SBE, all lecturers and students at the workshops were requested to take part in a lifestyle quiz. The main question of the quiz was *Is one earth enough to sustain everyone if they had your lifestyle*? Other questions focussed on transport, housing, energy use, food and how we handle our household rubbish. The quiz results revealed to the workshop participants that they were using far more than their share of the earth. After a discussion of the results the participants reached a consensus on the need to consider changes in lifestyles and approach to study programmes. In a plenary session, the workshop participants declared the workshop a success and urged the school administration for more action on adopting ESDGC in teaching, research and consultancy activities of the school.

Change Project outcomes

This section describes the main changes in the SBE to which the ESDGC Change Project contributed. Most importantly, the school has since reviewed its foundation courses (first year courses) in Sociology, Economics, and Physical and Human Geography to include ESD concerns. The review of courses was done through a school committee of Heads of Department, which reported to the SBE board of studies and approval was granted by the Copperbelt University Senate.

The SBE has also established a practice office through which it provides leadership and professional skills and competency to address practical human habitat challenges. For the teaching staff, the practice office is a place for applied research, consultancy, and professional development, as well as a place to contribute to community service and problem solving and a place to prepare students for the new built environment challenges that will be a part of their working life. For students, the project office is a place where they gain life skills in Architecture, Building Science, Real Estate and Urban and Regional Planning.

Additionally, the International Labour Organisation (ILO) is undertaking a project "Enhancing Competitiveness and Sustainable Business among MSMEs in the Building Construction Industry", with the assistance from the Copperbelt University through the SBE practice office. The SBE and ILO have been arranging and hosting seminars and public lectures on green construction technologies, short duration training programmes on green construction technologies, arranging student competitions on green construction and facilitating visits to green construction sites. Finally, the two Sida ITP participants are working on a tool to evaluate the Change Project from an ESD perspective. This will entail designing and using a *sustainability assessment tool* in assessing the extent to which the school is sustainable in its teaching, research, operations, outreach and student opportunities.

Challenges experienced

The main challenge experienced by the school administration and the ITP participants, was dealing with resistance to change, which, as Kibwika (2006) points out, is common in institutions of higher education. This resistance is partly because some members of staff are comfortable with things the way they were before and

they disagree with being pushed out of their comfort zones. Some have not yet fully appreciated ESDGC and so they do not see any reason to change anything. The lesson here is that it is important for advocates of ESD to make an extremely good case for its introduction in an institution. One way of achieving this can be through staff workshops to create an understanding of the USAT audit results and their implications. It may also be important to create an environment for regular staff interaction on ESD activities with the objective of making staff acknowledge and accept the Change Project.

Conclusion

In this chapter, we have shown how a combination of the Unit-based Sustainability Assessment Tool (USAT), the Sida International Training Programme process, and institutional workshops helped us to introduce an ESD Change Project in the School of the Built Environment at the Copperbelt University. The Change Project increased awareness within the SBE that there is a need to embrace ESD if the school was to remain relevant within a rapidly changing global context and make a contribution to the quality of life of all living beings in the country and beyond.

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Chapter 23: Integrating Kaizen Management Principles With ESD In Ethiopian Institute Of Technology-Mekelle, Mekelle University

Weldegebriel Abraha Hagoss and Hadush Berhe Asgedom

(Mekelle University, Ethiopia)

Abstract

In an effort to integrate environment and sustainable development issues into the activities of the Ethiopian Institute of Technology-Mekelle, Mekelle University (EiT-M, MU), we participated in SIDA's International Training Programme on Education for Sustainable Development (ESD) in higher institutions. This participation resulted in a Change Project entitled *integrating the kaizen management principles with Education for Sustainable Development in higher education*. As part of this ongoing Change Project, the team consulted relevant stakeholders regarding the importance of implementing kaizen management principles in Mekelle University, the relation with the environment and contributing towards sustainable development in Mekelle University. The team also organised joint regional and national conferences, seminars and workshops in Mekelle University to create awareness in the university community of Ethiopia about clean working environments, waste minimisation and elimination, waste collection and disposing, and cultivation of the university environment.

Major outcomes of the Change Project were presented to the university's top management, the Ethiopian kaizen institute, and the top regional and federal government officials. As a result, an MSc. programme in the kaizen process for a cleaner and sustainable environment was launched. Twenty MSc students are enrolled and have finalised their first year course work. Additionally, employees of the university have produced different waste collection containers and transportation materials. The university's top management, the Ethiopian kaizen institute and the regional and federal government officials are setting up a committee to spearhead the development of the kaizen philosophy into the manufacturing industries of the country and they are assembling a multidisciplinary team to develop a curriculum for a PhD programme.

Introduction

The Japanese management system that enables continuous improvement and involves everyone in an organisation in the process (Desta, 2012). Kaizen literally means *Change for Good*. Kai means *to take apart; to change,* and Zen means *for good,* which together means to *take apart and change for good* (Ohno, Ohno & Uesu, 2009). The philosophy originated in Japan in the mid-1940s to improve Japanese products and was later introduced to an international audience by Imai (1986) (Ishiwata, 2009). Imai (1997, p. 1) states that "the kaizen philosophy assumes that our way of life – be it our working life, our social life, our home life – should focus on constant-improvement efforts". It is a unifying thread running through the kaizen philosophy, systems, and problem solving tools, which can be applied to processes in manufacturing, engineering, and business management, but also to the service sector and public and non-profit organisations (Ishiwata, 2009).

Thus, kaizen is a structured problem solving approach that can be applied to every context, such as the tertiary education sector. The objectives of kaizen are to eliminate waste in organisations, increase productivity, improve quality, generate new ideas, save in energy, material and others resources, and improve

the working environment. Working area problems in higher education institutions can be resolved by applying initiatives of kaizen in creating clean working environments. The purpose of our Change Project is to combine Education for Sustainable Development (ESD) and kaizen management principles and integrate them into the Ethiopian Institute of Technology-Mekelle, Mekelle University. This chapter highlights the changes that have taken place in the last year, as well as the university's commitment to socioeconomic development that supports environmental protection and sustainable development. Over the last year, the team has taken a number of initiatives and actions, with consultation of the SIDA ITP programme in South Africa, to address the complex and interlinked issues of ESD for higher education through integration of kaizen management principles.

Rationale of the Change Project

It is imperative that the management of an organisation ensures that the working environment is appropriate for the purpose of the organisation that it complies with requirements, that it continually improves its effectiveness, and that it provides a framework for establishing and reviewing quality objectives, which are communicated and understood within the organisation (Thorpe, 2009). Moreover, management needs to ensure that the working environment is appropriate to the nature, scale, and the environmental impacts of its activities, products or services. This entails a commitment to continual improvement and prevention of pollution, commitment to comply with relevant environmental legislation and regulations and with other requirements to which the organisation subscribes. These needs do not only apply to businesses, but are also relevant for universities and other institutions of higher education.

Prior to our Change Project, the concern about Education for Sustainable Development in the Ethiopian Institute of Technology-Mekelle, Mekelle University was null. The working environment was disorganised and scraps, waste papers and working products were simply left in the environment of the university. The need for the planting of trees and maintaining a clean working environment in line with the cleaner production aspect was not recognised. Cleaner production is concerned with prevention of waste generation by maintaining a clean working environment, raw materials substitution, process control, modification of equipment, using better technology, producing useful products, product modification and recovery or recycling of by-products. It is a proactive environment strategy focusing on continuous application of integrated systems of processes, finished products, and services so as to enhance the overall efficiency of and reduce risks to human and environment (APINI, 2010). Due to this need for cleaner production, we proposed a Change Project aiming to integrate the kaizen management principles with ESD principles in academic programmes at the Ethiopian Institute of Technology-Mekelle, Mekelle University.

Goal and objectives of the Change Project

The general aim of the project is to promote ESD through the integration of the kaizen management principles and techniques into teaching, research, community engagement, and the university's management. This includes the greening of university infrastructure facilities, and to enhance student engagement and participation in sustainability activities both within and beyond the university. To achieve this goal, the project set out five specific objectives, as listed below.

- Provide a strategic platform for the mainstreaming of environment and sustainability concerns into the Mekelle University system, through integration of kaizen management system to facilitate the employees in the university in networking on sustainability and eliminating or minimising wastes.
- Build a professional leadership needed for the prevention of and responses to environmental issues, risks and associated sustainable development challenges.

- Contribute to revitalising the university community and enabling it to address current sustainable development challenges, with an emphasis on the university surrounding.
- Recommend inclusion of kaizen management principles and ESD into the teaching and learning curriculum.

Methodology deployed

Various methodologies were used to achieve the above stated specific objectives and ultimately meet the identified goal of this Change Project. Data was obtained through an extensive literature survey related to kaizen philosophies and environmental management systems. Subsequently, information about the university was collected through substantive observation of the working environment and questionnaires, which were filled in by top management, middle management, students and employees. We also developed quality circle teams, i.e. discussion groups with stakeholders, in different sections of the institute, and conducted national and regional workshops. Moreover, experience was gained from field visits from manufacturing industries in northern Ethiopia.

Implementation process

In order to get approval from the university, the team developed a concept note (an implementation proposal) for the kaizen implementation process, which identifies implementation strategies and procedures. The university approved the implementation agenda and plays an active role in facilitating the project.

The implementation process consisted of three main phases. First, there was a need to create awareness about the need for Education for Sustainable Development, and to inform administrative and academic staff and students about kaizen management and the opportunities it offers to integrate ESD into the university system. This was done through the development of a training manual and through various formal and informal trainings. Second, the team observed the existing situation of the work environment and set out to improve it by implementing kaizen principles. Third, kaizen and ESD principles were integrated into the curricula through the launch of an MSc programme in kaizen.

Creating awareness

To create awareness under the academic staff and students and to spread the knowledge of kaizen management philosophy, we developed training manuals in both English and the local language, Tigrigna. The manuals provide an overview of the 5-S kaizen principles (Sorting of the working activities; Straightening the working activities; Shining of the working activities; Standardisation of the working activities; and Sustainability of the working activities) and their importance to Education for Sustainable Development. It incorporates the concept of *muda* (i.e. types of waste and waste elimination), kaizen quality circles and cleaner production, quality control circles, quality control tools, work motion and time study, and functional management[24].

Based on the developed manuals, formal and informal training was given to students and academic and administrative staff of the Ethiopian Institute of Technology-Mekelle Mekelle University. The trainings involved discussion sessions and presentations, which covered the importance of the kaizen management system, the integration of the environmental and sustainability issues in higher education, and the urgency of mainstreaming Education for Sustainable Development. The formal trainings were undertaken on an arranged time and resulted in an enhanced awareness about kaizen and ESD in the university community. The informal

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[24] The seven wastes originated in Japan, where waste is known as *muda*. To eliminate waste it is important to understand exactly what waste is and where it exists (Homma, 2012).

trainings were not scheduled and took the form of, for example, coaching during the job training and resulted in internalising kaizen and environment for the sustainability principles in higher education.

Observing and improving the work environment

After creating awareness and building advocacy for the Change Project, the team set out to observe and improve the conditions of the work environment. After observing the situation of the university before the implementation of the Change Project, we observed the different workshops and working environments of the university community as whole. This provided input for the analysis of the situation after the implementation of the Change Project, i.e. after integration of kaizen management principles with ESD in the university.

The implementation team has made significant improvements on the maintenance of non-functional laboratory equipment, and the cleaning, sorting and shining of the working environment. Moreover, the arrangement of the laboratory equipment was previously not properly managed. Thus, we set out to reorganise the layout of the laboratory equipment. The workshops and laboratories of the university were cleaned and improved by separating the non-functional from the functional equipment, making proper arrangements through sorting, straightening, shining, standardising and sustaining of the locations.

Various members of staff were involved in improving the work environment. Their creativity and innovation let to the development of waste eliminating and accumulation containers. Moreover, there is a yearly plantation and grassing programme with the slogan *Green Campus for Green Economy,* which produces a green university that is part of the green economy. The plantation process, which will occur every year, reduces the deforestation on the university campus. This helps to secure a more beautiful and healthy environment. In addition to this, it mitigates climate change effects in the immediate surroundings of the university.

Launching of MSc programme in kaizen

The momentum of transformation of agricultural lead to industrial lead economical development strategy of Ethiopia, demands high-level graduates in different fields of specialisation. The MSc programme in kaizen aims at extending the knowledge and awareness created during the Change Project. The Ethiopian Kaizen Institute (EKI) and the Ethiopian Institute of Technology-Mekelle, Mekelle University, signed a memorandum of understanding to launch a Master programme in the area of kaizen philosophy (i.e. continuous quality and productivity improvement). The general objective of the Master programme is to develop graduates specialised in the area of kaizen productivity and quality improvement integrated with the environment, to meet the demands of Ethiopia in the manufacturing and service industries. Specifically, to produce professionals capable of providing consultancy services in industrial sectors; undertaking collaborative research between different universities, industries, technology centers and research institutions; and assisting the development of the country through outreach programmes.

A team was put together from members of the university and the Ethiopian Kaizen Institute to develop the new course programme. Among the courses included in the programme are Research Methodology and Scientific Seminar, Quality and Productivity Management, Change Management and Workplace Discipline, Introduction to Kaizen Philosophy, Communication Skill and Suggestion System, Implementation of Quality Control Circles, 5-S Principles and Practices, Application of 7 Quality Control Tools, Work Study, Plant Layout and Safety of the Environment, and Total Quality Management for the cleaner production and sustainable working environment. Currently, nineteen students are enrolled in the programme. They finalised their course work and are conducting their MSc thesis works.

Future of the Change Project

As an extension of the kaizen philosophy in the manufacturing industries in northern Ethiopia, a collaborative research with Dominican University of California was undertaken, entitled *Situational analysis of manufacturing industries in northern Ethiopia and kaizen implementation process in selected textile, leather and metal manufacturing industries*. The research findings were presented to the university staffs and students and published in an international journal. Various other projects have been set up to continue the integration of kaizen principles for ESD. Currently, the team is working on establishing an excellence centre related to kaizen philosophy for improving the quality and productivity of manufacturing industries as a continuity of ESD.

Creating networks and partnerships

To continue the Change project, the team is now doing a comparative analysis research on kaizen implementing and non-implementing universities in Ethiopia. Moreover, the team is discussing on participation in short- and long-term training in Japan; hopefully resulting in an assessment of the manufacturing industries in Japan, Malaysia, and Tunisia.

Additionally, guidelines have been developed for the establishment of international collaboration on future research works, launching of programs and excellent centers, with Japan and the United States of America. In addition to this, as mentioned, the team is working on establishing a kaizen excellence centre. This initiation for creating collaboration and partnerships is aimed at ensuring the sustainability of the Change Project programme and to further implementation of kaizen principles.

Moreover, the university is preparing an international workshop on integration of kaizen for Education for Sustainable Development. The university is now fully supporting the activities of the Change Project.

Development of PhD programme

As a long-term plan, the team is in dialogue with the university's top management and is searching for international collaborations to develop a PhD programme on integrating kaizen and ESD principles in Ethiopian higher education.

Conclusion

The kaizen management principles Change Project is now harmonised with the mainstreaming of ESD in Mekelle University. Observations were made of the different workshops and work environment to assess the existing situation, which led to corrective measures. A concept note on the kaizen implementation process, identifying implementation strategies and procedures, was developed in collaboration with the university management. Additionally, training manuals in both English and a local language were developed. Subsequently, trainings were given for administrative and academic staffs and students concerning ESD, cleaner production and the kaizen application. Lastly, an MSc programme was launched, which currently has an enrolment of nineteen students.

Recommendation

The recommendations raised by the team assuming that further attention is needed are:

- Excellence centre should be established so that Mekelle University will function as a benchmark for other universities in the country;

- The university will need to upkeep the sustainability of the Change Project to bring continuous improvement;
- The university management and other stakeholders need to actively cooperate to organise an international conference, as a successor of the national conference;
- The university management and the team should actively work on creating partnerships with international and national universities and organisations related to ESD in higher education as a means of mitigating climate change in developing countries;
- International collaboration must be established for further expansion of the MSc, programme into a PhD programme and to further integrate research activities, such as training programmes, consultancy service, and short- and long-term coaching activities to manufacturing and service industries in the country; and
- The university management should work on the initiation of course of ESD in to part of the education curriculum.

Acknowledgement

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Chapter 24: Driving Activities In ESD to a Higher Level: Experience From The Faculty Of Education At Eduardo Mondlane University, Mozambique

Aguiar Baquete

(Eduardo Mondlane University, Mozambique)

Abstract

Education in general, and higher education for sustainability in particular, is viewed as the anchor for sustainable development of any society whether developed or not. Formal teaching and learning presents a privileged place for moulding and promoting new and innovative ways of thinking. A new way of live based on new technology. In other words, higher education can lead the process of incorporating different perceptions and worldviews and make an important contribution to the promotion of a Education for Sustainable Development (ESD). If formal higher education is a place for innovation and new teaching and learning initiatives, then teachers' conception of it are fundamental because they are the vehicle through which the importance of democracy in teaching and learning can be transmitted and get recognised by the learner as the cornerstone of society. This paper describes the development and ongoing experiences of integrating ESD in the Faculty of Education at Eduardo Mondlane University, *Universidade Eduardo Mondlane* (FACED-UEM). The methods utilised include elements of action research. Preliminary results show that the community of the environmental programme offered by the Faculty of Education (LEA) is interested in adopting the principles, values and practices of ESD in a constructive way.

Introduction

The University Eduardo Mondlane (UEM) is a public university based in Maputo City, Mozambique, but with branches in different provinces, with a total of about 14000 students in licenciatura, master and doctoral programmes covering different areas of knowledge, such as Environmental Education, education, engineering, medicine, arts, science, and architecture.

The Faculty of Education counts about one thousand students on licentiatura and master programmes on environmental education, psychology and education for especial needs, science and mathematics education, teacher training, curriculum development, adult education, organisational and educational management, and distance education. The faculty's mission is to drive innovative thinking and promote new knowledge in the field of education. Since the introduction of the Environmental Education Programme (LEA) in 2010, the faculty is strongly involved in advocating the importance of effective teaching in building environmental awareness. LEA aligns itself to international policies to increase the importance of sustainable education as a core principle of the United Nations Decade of Environment and Sustainable Education (DESD). For example, LEA has been promoting workshops and seminars anchored in the environmental policies by the United Nations and the Mozambican government.

Since UEM is aware that ESD is an international issue, it has been promoting and encouraging its staff to cooperate with other educational institutions in Africa. Based on that encouragement in 2011, the researcher attended a workshop in Swaziland on Mainstreaming Environment and Sustainability in African Universities (MESA). Furthermore, in 2012, he attended the International Training Programme (ITP) sponsored by

Sida/SAREC, NIRAS and other partners. Through participation in SIDA's International Training Programme (ITP) in 2012, the LEA coordinator acquired knowledge and instituted LEA as the focal point of ESD development within the Faculty of Education. Various initiatives were developed, such as the promotion of a conceptual and philosophical discussion on ESD and the design and development of an ESD implementation strategy in the Mozambican context in general and in UEM in particular. This chapter describes the development and challenges faced during the ongoing integration of ESD at the Universidade Eduardo Mondlane, Faculty of Education (UEM-FACED).

The Change Project at UEM

The Change Project was conceptualised during the first phase of the ITP and implemented during phase five of the programme. Furthermore, the project has been reinforced by interactive debates among Environmental Education students and members of the local MESA branch, based in Maputo, which is composed of lecturers from UEM (LEA and the Geography Department) and, Faculty of Mathematics and Natural Science at Pedagogical University.

Since 2012, LEA has been continuously mobilising ESD advocates committed to ESD principles, values and practices within the faculty, including both lectures and students. The programmes initiatives lead to the introduction of ESD in the Club of Environmental Education (CEE). New activities were designed for the club based on students' interests. Another initiative was the development of new teaching and learning strategies based on ESD for the design and development of didactics materials (DDM) course. LEA also promoted continues and interactive debates into the FACED community. Also, LEA has been interacting with Secondary and Primary schools on issues associates with:

- environment;
- green economy;
- Environmental Education;
- Sustainable Development (SD); and
- Education for Sustainable Development.

These debates were organised in cooperation with different stakeholders, including members from MESA and ITP teams, such as Professor Robert O. Rossi and a senior expert on environmental education and ESD from Rhodes University, Professor Heila Lotz-Sisitka, who coordinated and supported the realisation of the October 2012 workshop in Maputo at the UEM Faculty of Education.

As mentioned earlier, formal education presents a place and opportunity to develop and promote new and innovative thinking. Incorporating ESD in higher education is a social need because contemporary literate citizens require a holistic vision of the world. If formal education is a place for innovation and development of new teaching and learning initiatives, then teachers' conception of innovation and ESD is fundamental, since teachers are the vehicle through which the importance of democracy in teaching and learning can be transmitted and recognised by the learner as the cornerstone of society (Richmond, 2010). According to Davis (2006, cited in Bohensky & Maru, 2011) the inclusion of the learner's preliminary knowledge into formal education, from initial to higher level, can approach the formal education to the learners' everyday life, in the present case the Mozambican communities, and consequently reduce the foreignness of the formal education. In Africa preliminary knowledge is anchored in indigenous knowledge, embedded in ecological principles and respect of environment, and this can become a starting point to discuss Education for Sustainable Development (ESD) in formal education. It can also a form a link between the learners' environment, i.e. daily life at home, and their education.

Aim and objectives

The main aim of this project is to establish and develop awareness of education for sustainably development in the Environmental Education Programme (LEA) in the Faculty of Education at Eduardo Mondlane University (UEM).

The objectives of the LEA Change Project were to:

- Develop ESD awareness through activities, seminars and workshops;
- identify and share good teaching and learning practices associated with ESD within UEM;
- share identified ESD practices with staff members of FACED-LEA and teachers from Noroeste II Secondary Schools and
- identify areas where educational policies may need to be developed in order to accommodate the new teaching approaches based on ESD. For example, the implementation of teacher training.

Implementation

During the implementation phase, in The Faculty of Education at UEM, the project aimed to design interactive teaching and learning concepts and issues related to Environmental Education (EE), based on the philosophy of EE, ESD and SD principles. We started by clarifying how to implement the project in our specific context, especially challenged by a lack of academic culture (even in higher education) and the absence of a volunteering culture among lectures and students (more in higher education than other educational systems).The methods used in the implementation phase included elements of participative action research (Emery, 2000; Tickle, 2005; Meyiwa, Letsekha & Wiebesiek, 2013),which was useful as it allows for the evaluation of teaching and learning strategies established in the actual curriculum of the Environmental Education Programme (LEA) offered by the faculty.

Two main initiatives were undertaken to introduce in ESD at the Faculty of Education in UEM:

1. Out of twenty-two core subjects, one subject was chosen, Development of Didactics Materials (DDM) (*Elaboração dos Materials Didácticos*), for experimental development of strategies and activities based on ESD.
2. The Club of Environmental Educators (CEE) (*Clube the Educador Ambiental*), was evaluated based on participative action research and ESD-related activities were designed for the club.

Additionally, a set of activities, seminars and workshops were organised in order to build awareness among lecturers and students on environmental sustainability and how its values and principles can be incorporate into our educational programme.

Integrating ESD into the Development of Didactics Materials course

As a result of the first initiative, a new teaching and learning approach was adopted for the subject Development of Didactics Materials (DDM). In the new approach the teaching and learning activities were divided in two main sections. In the first theoretical section, teacher and students interactively discuss the concepts, objectives, and the role of the subject as related to the whole Environmental Education programme. The second section entails that groups of students design and develop interactive and learning-centred teaching and learning materials to be presented to the class.

In line with the second initiative, mentioned in the previous section, the coordinator of the Environment Education Programme planned a cycle of debates and workshops involving the Club of Environmental

Educators (CEE) members. Initially, the workshop and seminars deal with ESD epistemology based on the DESD and the Brundtland Commission principles, values and practices. This was followed by a regional workshop where the mains focus was on the concept, philosophy and aims of ESD and SD in higher education institutions. At the same time, a probing was conducted based on action research in order to improve the club activities and extensions of the LEA.

Results

In order to address the low awareness among students and lectures regarding the concepts and principles of Environmental Education (EE), Sustainable Development (SD), and Education for Sustainable Development (ESD), we organised internal workshops. We designed didactic, pedagogical actions from the assumption that it is possible to develop skills, abilities and awareness of Environmental Education and Education for Sustainable Development based on participatory educational methods rather than activism (Mayer, 1998). The workshops promoted a harmonisation of the concepts of EE, Sd, and ESD. Different materials were used during the workshops and seminars. For instance, the adapted model of the typological conceptions formulated by Sauvé (1992, 1994, cited in McGregor, 2013), see Table 1.

Environment	Relationship	Characteristics	Methodologies
As nature	To be enjoyed and appreciated	Nature as a cathedral or as a womb, pure and original	• exhibition • immersion in nature
As resource	To be managed	Biophysics collective heritage, quality of life	• campaign of the 3Rs • audits
As problem	To be solved	Emphasis on pollution, deterioration and threats	• problem solving • case study
As a place to live	Environmental Education for, about, and taking care of the environment	The nature of its social, historical and technological components	• gardening projects • places or legends about nature
As biosphere	Place to be divided	Spaceship Earth, "Gaia";the interdependence between living and inanimate things	• case studies on global issues • stories with different cosmologies
As community project	To be involved	Nature with a focus on critical analysis and political participation of the community	• research (action) for participatory community transformation; • discussion forum

Table 1: Adaptation of elements of environmental typological conceptions formulated by Sauvé, (1992, 1994, cited in McGregor, 2013).

Furthermore, the project intended to design and develop interactive, instructional teaching and learning materials in Education for Sustainable Development (ESD). In order to do that, a qualitative approach was used, based on participative action research. Thus, the participants were invited to design the project and define its mains objectives.

Lastly, a Club for Environmental Education into FACED was established, based on teaching strategies designed for LEA and inspired by ESD literature (Sarabhai, 2010; MICOA, 2009). All club activities were defined in a open and interactive meeting.

Conclusion

The Change Project of the Faculty of Education at Eduardo Mondlane University designed and developed new teaching and learning materials that are informed by ESD concepts and values. Besides promoting interactive and critique learning, the new materials also deal with socio-cultural differences, because the Mozambican society is a multi-cultural community (Baquete, Grayson & Mutimucuio, 2012). ESD can help the learner to gain awareness and acceptance of these differences. In other words, as new philosophy of teaching and learning in the Environmental Education course at Edurado Mondlane and in non-formal education in Noroest Secondary School, ESD introduces a new thinking approach and improves the quality of education in Mozambique.

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Chapter 25: Towards Integration Of ESD In Teaching And Training Programmes: A Case Study Of The High School Of Technology Of Salé, Morocco

Youssef Lefdaoui and Abderrazak Khohmimidi

(Mohammed V University-Morocco)

Abstract

Presently, the African continent faces many problems. The major challenges are the social and economic development. The issues to deal with are difficult, numerous and deeply rooted. Among the solutions suggested to improve the social and economic development and prosperity of Africa is education. Particularly higher education, since the universities are an important incubator for knowledge conception, creation and sharing among academics and students. The adequate practice of Education for Sustainable Development (ESD) in African higher education institutions implies that graduates from these universities will be sufficiently empowered to apply their acquired knowledge to improve their livelihood, take enlightened and informed decisions and influence the lives of others. ESD is internationally recognised as an important contributor to a more equitable and sustainable society and the United Nations has declared the period 2005 – 2014 as the Decade of Education for Sustainable Development. In this regard, we had the opportunity to participate as Moroccan university professionals to the International Training Programme entitled Education for Sustainable Development in Higher Education. We suggested an ambitious ESD Change Project to implement in our institutional setting. Several workshops were proposed to introduce ESD and create awareness among students and lectures. Additionally, a new course entitled *An introduction to sustainable development* was proposed and accepted. We are pleased, to explain our Change Project and its process, steps, challenges, pitfalls and expectations regarding this unique and awarding venture.

Introduction

Morocco is an African country situated in Northern Africa. Since its independence from France in 1956, the country has tried to ensure a good and suitable social and economic development for its population. The different governments implemented several strategic plans to improve the country's economic and social situation. However, many problems exist presently, mainly the poverty issue, the high rate of unemployment, especially among the young graduates, the high rate of illiteracy, and major environmental issues (e.g. pollution, drought and irregular rainfall). Despite the many efforts deployed by the governments, the field of education, and in particular higher education, suffers from many unrests, such as overcrowded classes in some universities; the discrepancies between the courses provided in universities and the national job market, which is quickly shifting; the scarcity or nonexistence of some study programmes that should be taught to students, such as university methodology, critical thinking, environment management; lack of public funding of higher education; and the underemployment and resulting insecure future for the graduates.

Moroccan public authorities are becoming very aware of the different sustainability issues in the country. Besides, we have international agreements to respect and comply with in this matter. Morocco has recently established a Sustainable Development Charter, which sets out Morocco's sustainable development policy

pillars, but it unfortunately does not include a vision of ESD in higher education. However, this charter could be very useful, as a platform to conceive and put in place an ESD national policy.

Morocco has about sixteen public and seven private universities and this number is constantly growing. The main teaching language is French (except for the Al Akhawayn University, a public, privately funded university, which uses English). A few of these universities teach some modules of sustainable development to their students. Many of the universities have not heard about or do not understand the concept of Education for Sustainable Development and therefore miss an important international practice.

Institutional context

Our institution is called *Ecole supérieure de Technologie-Salé* (High School of Technology-Salé), which is a component of Mohammed V University. The school began its activities in September 1993 and its students, once successful, are awarded a national *Diplôme Universitaire de Technologie* (Technological University Diploma). The comprehensive two-year training programme includes two professional trainings in public administrations or in private firms, such as insurance and financial companies. The students are also asked to undertake a personal project at the end of the study (*Projet de Fin d'Etudes*) and publicly present and discuss it in front of a jury composed of experts, professors and visitors. Presently, the students pursue their studies within different departments in the school:

- Management Techniques;
- Computer Science Engineering;
- Maintenance Techniques; and
- Civil and Environmental Engineering.

In October 2014, the school starts a new public Bachelor degree programme called *Licence professionnelle* (Professional Bachelor), which includes fields like logistics and energetics. The institution has always been innovative in proposing and developing new teaching and training programmes to respond to the knowledge aspirations of students and to continuously adapt to the requests and shifts of the job market. Despite this, the study programme developers and academics have rarely considered how to provide students with analytical and methodological tools to enable them to use a sustainable development approach, how to solve economic and social problems efficiently, and how to positively use ICT (Information and Communication Technologies). Besides, the teachers themselves have never been informed about the adequate ways of integrating Education for Sustainable Development into their study modules and programmes. Therefore, an important cornerstone has been missing from our school's study programmes.

The institutional Change Project

Amongst the contemporary realities is the world's high speed and the change dynamic that inevitability pushes towards the progressive integration of Education for Sustainable Development within the higher education system. More effort is required to enhance teaching capabilities and to adapt training and teaching to actively contribute to the Moroccan national strategy in the field of sustainable development.

To address the various challenges faced by ESD at different levels, our Change Project aspires to be a pioneer initiative to examine the introduction of ESD in higher education in Moroccan universities. The projects aims to provide a platform for different actors in this field to exchange view points, to collaborate around the different concepts and principles of sustainable development and together suggest approaches to implement the dimensions of sustainable development within their own higher education training programmes. The main goal of the Change Project is to promote ESD, in the university's system and to develop a network

of expertise in Mohamed V University to facilitate the implementation of this process in all the institutions affiliated to the university in the upcoming years. In doing so, the project aspires to meet the goals of the UN's Decade of Education for Sustainable Development (DESD).

There is an overwhelming need to embed ESD concepts firmly into the schools' curricula and to develop appropriate pedagogical patterns, lesson plans and teaching materials. To address this need, our project tries to enhance the capacity of the teachers who play a major role in transmitting knowledge, values, principles and skills to their students. One aim of the project is to assist teachers to design and integrate ESD contents into their teachings of Management and Engineering materials, and by using information and communication technologies to support the teaching and learning process of ESD. Another aim of this project is to enhance and encourage the collaboration between teachers in intra-, inter-, multi- and transdisciplinary institutional frameworks to apprehend the complexity of issues related to ESD in the current teaching programmes. The specific objectives of the Change Project are to:

- advocate ESD assets and benefits by introducing teachers to the concepts, principles, values, context and content of various ESD thematic issues;
- examine how these concepts, principles, values, context and content can be incorporated into the teachings and studies learning programmes;
- promote action-research to document good practices of curriculum development and pedagogical approaches of ESD; and
- facilitate collaboration in developing educational resources related to ESD.

Implementing the Change Project

In order to reorient a curriculum to address sustainability concerns, academic communities need to identify knowledge, challenges, perspectives, competencies and the values supporting sustainable development in its three components: environment, society and economy. The higher education community should also select the different sustainability issues that will be part of the training programme, for instance biodiversity, climate change, equity and poverty, and link these issues with the sustainable development objectives at national, local and global levels. This task cannot be achieved without the commitment of all the stakeholders involved in the process of readjustment. Following a deep contextual analysis in terms of pedagogical contents, practices and the use of information and communication technologies in the teaching modules of the Ecole supérieure de technologie-Salé, we have defined four workshop topics to strengthen the incorporation of Education for Sustainable Development in the academic programmes. These workshops are the following:

- Workshop 1: The concepts and challenges of ESD. The first workshop was held in our school on 26th September 2013, in the presence of the Regional ITP Coordinator Dr Amanda Hlengwa (Rhodes University, South Africa).
- Workshop 2: The curriculum design for training related to ESD: strategies and models of ESD integration. This workshop has not be held yet due to a lack of national experts in this field.
- Workshop number 3: The teaching and training methods to develop competencies related to ESD. This workshop has also not been not undertaken yet due to a lack of national experts in this field.
- Workshop number 4: The use of information and communication technologies in ESD trainings. This topic was covered in various practical workshops by Professor Youssef Lefdaoui. These workshops covered the use of ICT in their teaching programmes and the added value of ICT in ESD. It also introduced technological tools like the Smart Board.

Additionally, the most tangible outcome of the project is the development and acceptance of a new academic course entitled *An introduction to Sustainable Development*. It is a new teaching programme in the High School of Technology-Salé. It will be taught by Professor Abderrazzak Khohmimidi starting September 2015 and will be offered permanently to second year students of the Management Techniques Department.

Hopefully, if a qualified lecturer in the field of sustainable development becomes available, the course will also be given to students of the other departments.

The course aims to create a preliminary awareness among the students in the different matters related to sustainable development and especially ESD in higher education to enable students to develop critical thinking skills, to be innovative in conceptual and practical reasoning, and to be able to use efficient tools to solve different problems that they will surely face during their careers and personal lives. Table 1 gives an idea about the new course to be implemented in the schools' programmes.

Course title	Class targeted within the Department	Semester	Key content
An Introduction to Sustainable Development	Finance, Accounting and Fiscality	Fall 2015	• Sustainable Development • University students and sustainable development, ESD in the university • Case studies in ESD applied to finance, accounting and fiscality
An Introduction to Sustainable Development	Commercial Techniques	Fall 2015	• Sustainable Development • University students and sustainable development, ESD in the university • Case studies in ESD applied to trade and merchandising
An Introduction to Sustainable Development	Finance and Bank Marketing	Fall 2015	• Sustainable Development • University students and sustainable development, ESD in the university • Case studies in ESD applied to banking and marketing
An Introduction to Sustainable Development	Communication and Administration Management	Winter 2015	• Sustainable Development • University students and sustainable development, ESD in the university • Case studies in ESD applied to communication and administration management

Table 1: Outlines of the course *An introduction to Sustainable Development* to be introduced in September 2015 for the students of Management Techniques.

The Change Project outcomes and their significance

Thanks to an extensive literature study and the serious commitment to our institutional Change Project, we have achieved many valuable goals. Although there is still work to do, the following outcomes form a good start:

▪ Awareness was created about ESD and its benefits within the academic community in our local setting, at the university level and hopefully on a national academic scale.

- Learning and experimenting with a challenging practice that was previously new to us, was a valuable experience to us and the school.
- The project raised many questions on our teaching and training methods with regard to the logic of ESD. These questions are important because they cause a deep reflexion about the way courses, study programmes and curriculums are developed by the professors and how ESD can fit into these programmes to allow students to become aware of sustainability during their studies and after graduation.
- The teachers were enabled and urged to think critically and adopt a holistic approach to the design, development and enhancement of ESD into their teaching programmes.
- The knowledge and skills of teachers necessary to teach ESD concepts were increased.
- Good and innovative ESD practices in study programs for the benefit of student communities were implemented and shared.
- Resource materials on ESD were developed and shared with colleague professors and students.
- Development and implementation of a new course entitled *An introduction to Sustainable Development.*

The challenges and constraints encountered in the implementation process

Every new project stirs some kind of fear, questioning, doubts and so on. Our Change Project is no different from previous ones in other contexts. The main problems we have encountered are as follows:

- Scarcity of qualified experts in the field of ESD in higher education at the national level. Experts would have been excellent information assets to help us progressively and smoothly implement the Change Project.
- The reluctance and refusal of most colleagues to engage in the Change Project despite our attempts to simplify the concepts and features of the project to make it as accessible as possible.
- Some colleagues refused to communicate with us regarding the Change Project and argue that they do not have the time or the willingness to be involved in such a framework.
- Similarly, some school professors perceive the Change Project as a heavy and unpleasant burden to conduct. They conceive it as time consuming to deeply review their teaching patterns and ways.
- Many colleagues never showed up for meetings they were invited to to discuss the Change Project.
- Some colleagues simply opposed the Change Project and perceived it as something that will have no added value to their careers in terms of professional promotion or financial benefits, especially when the learn that the Change Project includes no specific payment to those who will engage in it.
- There was no funding available for the Change Project to allow us to travel within the country and abroad to look for national and international experts who can be invited by the school to give lectures to the teachers about specific aspects of ESD and to share their experiences in this field with us.

Conclusion: Is there a way forward?

The whole process of our Change Project made us very persistent as to our willingness to implement it. Even though we encountered several difficulties, we remained open to discussion for all our colleagues in the school. We have brought to the surface the issue of ESD in our establishment. The workshop in Sweden and the International Training Programme in South Africa have been excellent network and knowledge sharing spaces to deepen our understanding regarding our Change Project and to learn from the experiences of others. Our work is not done yet, we will pursue in this venture and we will knock on every relevant door to ensure a wide spread of ESD practice in our university. As an African institution we are engaged to ensure the sustainability value in our universities.

Chapter 26: Language And Literature Courses In Environmental And Sustainability Education: Curriculum Innovation At The University Of Botswana

Gregory H. Kamwendo and Tshiamiso V. Moumakwa

(University of Botswana, Botswana)

Abstract

The current chapter discusses a Change Project in the form of curriculum innovation that took place in the Department of Languages and Social Sciences Education in the Faculty of Education at the University of Botswana. Two courses were developed as a result of this initiative, which will feed into a proposed MEd programme in environmental and sustainability education. The courses are *Language and Sustainable Development* and *Literature and Environmental Issues*. More of such courses are needed to feed into the inter-/multidisciplinary MEd programme. The Change Project lies within efforts to mainstream environmental and sustainability issues in higher education in Africa. In addition, the Change Project is a practical demonstration of the fundamental principle that working in academic silos is no longer the way to take.

Introduction

In this chapter, we discuss curriculum innovation at the University of Botswana (hereafter, UB). This Change Project was run by two language educators (the current authors) in the Department of Languages and Social Sciences Education in the Faculty of Education at the University of Botswana. The project involved the development of a literature course (*Literature and environmental issues*) and a language course (*Language and sustainable development*). These two courses feed into a proposed MEd in Environmental and Sustainability Education. The aim of the literature course is to afford students opportunities to explore and examine environmental concerns from a literary perspective. The language course aims at exploring links between language and sustainability issues. The proposal for this MEd programme is currently going through the approval structures of the University of Botswana. The incorporation of language and literature courses into the MEd programme is a step towards the desire to promote inter- and multidisciplinary. This curriculum transformation at the University of Botswana is on the same page with regional (SADC), continental (NEPAD) and global positions and initiatives on environmental and sustainability issues. Once approved, the proposed MEd programme in Environmental and Sustainability Education will be the first one of its kind in the SADC region to have language and literature courses.

We have structured the chapter as follows. In the next section, we provide the context in which the Change Project took place at the University of Botswana. Next, we provide the rationale for the project. Thereafter, we present the curriculum innovation by giving overviews of the two newly developed courses. In the section that follows, we discuss challenges and the future of the Change Project. We wrap up the chapter with a summary and conclusion.

The context of the Change Project: Botswana and the University of Botswana

It is worthwhile at this stage to provide a brief overview of Botswana. Botswana is situated in Southern Africa, and shares borders with South Africa, Zimbabwe, Namibia and Zambia. Covering an area of 581730 square kilometers, Botswana is largely covered by the Kalahari Desert. The country is sparsely populated. Currently, Botswana's population stands at around two million people. Until 1966, Botswana (then called Bechuanaland) was a British protectorate. Botswana was a very poor country when it became independent in 1966. However, the situation changed dramatically after the discovery of diamonds. Botswana has since become a middle income country. The mining of minerals is the largest income earner for the country, whilst animal farming and tourism are the second and third largest income earners, respectively. Botswana takes environmental and sustainability issues very seriously. The country's national vision (also known as *Vision 2016*) bears testimony to this. For example, the Vision states:

> By the year 2016, economic growth and development in Botswana will be sustainable. Renewable resources will be used at a rate that is in balance with their regeneration capacity. The wildlife of Botswana will be managed for the sustainable benefit of the local communities, and in the interests of the environment as a whole. By the year 2016, Botswana will have taken strong measures to limit pollution that would otherwise have resulted from rapid industrialization (Republic of Botswana, 1997).

The overall responsibility of environmental matters lies with the Ministry of Environment, Wildlife and Tourism. Botswana faces two major environmental problems, namely drought and desertification. The country is generally arid, with little surface water. As such, the larger part of Botswana relies on ground water and the country experiences low rainfall rates. This means that most of the rivers do not flow for the larger part of the year. Due to low rainfall and the dominance of sandy and infertile soils, much of the land is not good for crop production.

Having given a brief overview of the general Botswana context from socio-economic, political and ecological perspectives, let us now turn to the site of the curriculum innovation. The University of Botswana, established in 1982, is one of two public universities in the country. The second public university is the Botswana International University of Science and Technology. Bearing the motto *thuto ke thebe* (Setswana expression for 'education is a shield'), UB is predominantly a teaching university given that the majority of its student population (16308 out of 17678) are undergraduates, whilst only a meagre 1370 are in the postgraduate sector. The UB plans to become a research-intensive university by 2021 by increasing its number of postgraduate students. The university has two campuses, with the main campus being located in Gaborone, the capital of the country, and the other campus being in Maun. The UB academic division is made up of six faculties, namely the Faculty of Business, Faculty of Education, Faculty of Humanities, Faculty of Science, Faculty of Social Science, Faculty of Health Sciences, Faculty of Medicine, and Faculty of Engineering and Technology.

The University of Botswana gives environmental and sustainability issues a prominent position in the institution. For example, one of the UB's thirteen institutional values states: "By deepening awareness and ensuring environmental issues are incorporated into student learning and teaching and research, the development of environmentally sustainable campuses and through contributing to the environmental sustainability agenda in Botswana" (Dube, 2012, p. 95).

In addition, the UB has an Environmental Sustainability Charter Working Group. The Working Group is made up of representatives from different faculties, senior management of the university, government departments, NGOs, the business community, and the Gaborone City Council. It "represents a high level policy stand on the need for UB to be a model of sustainable environmental practices and also to engage society at large" (Dube, 2012, p. 95). The Working Group began its work in 2009, with the mandate to carry out an environmental sustainability audit, draw an implementation plan, and eventually draw up a UB environmental sustainability charter (Dube 2012).

As a public university, the UB is expected to respond to the needs of the society in which it is situated. As far as environmental and sustainability needs of Botswana go, the University of Botswana is responding to them through its academic trinity, i.e. teaching, research and community engagement/service. For example, the university's research strategy for the period 2009 to 2016, has seven themes and includes environmental and sustainability issues, as listed below:

- Culture, the arts and society
- Economic diversification and entrepreneurship
- Environmental systems and natural resource management
- Health
- Indigenous knowledge systems
- Minerals, water and energy
- Social and political development
  (University of Botswana, 2008)

Further evidence of UB's strong interest in environmental and sustainability issues is demonstrated through the existence of the Okavango Research Institute (ORI) in Maun. ORI is a research centre dedicated to the study and conservation of the Okavango delta. This delta is one of the worlds' largest inland wetland ecosystems. ORI undertakes wetland research and training on wetland systems through an interdisciplinary approach. The centre also offers an MPhil and PhD programme in natural resources management.

Within the academic division, it is worth noting that there is a fully fledged department that is dedicated to environmental issues. The Department of Environmental Science in the Faculty of Science offers courses and programmes that cut across biophysical and human environments. The department also has links with outside institutions, such as government departments, NGOs and the Gaborone City Council. In the Faculty of Education, Environmental Education is offered as a course in the Department of Primary Education (training teachers for the primary school sector) and the Department of Languages and Social Sciences Education (training teachers for the secondary school sector). The home of the Change Project was the Department of Languages and Social Sciences Education. The department is multidisciplinary in its composition. It comprises the following academic units: Business Education, Environment Education, Social Studies, Language Education, Religious and Moral Education, History Education, and Geography Education. The Environmental Education Unit does not offer a programme, but only courses. That is, there is no undergraduate or postgraduate programme that specialises in environmental and sustainability education. Therefore, the proposed MEd programme will boost the image and sustainability for environmental and sustainability issues within the Department of Languages and Social Sciences Education.

Rationale for the Change Project

The aim our Change project was to strengthen linkages among natural science, social science and the arts. We wanted to work across the disciplines and aim to produce graduates who are well rounded and capable of handling environmental and sustainability issues from a strong foundation and background.

Curriculum innovation

As mentioned earlier, two courses have been developed to feed into the proposed MEd programme in Environmental and Sustainability Education. Let us start with the course on literature and environmental issues. The aim of this course is to afford students opportunities to explore environmental concerns in Botswana from a literary perspective. Viewing environmental issues with literary lenses would help students to develop the attitudes, knowledge, skills, values and perspectives that would allow them to play an active role in improving, protecting and nurturing the environment (see Down, 2003, 2005, 2008). Upon completion of the course, the learners should be able to critically assess the values, perspectives and attitudes that the literary

genres inculcate in sustaining the environment. Furthermore, the course provides students with opportunities to think of ways through which they can apply their literary knowledge and skills to nurture the environment. Literature can provide students with strategies to engage with texts critically. In this context, this course provides students with a framework for examining the role of literature in providing a context to problematise environmental sustainability. The course represents a way of implementing an interdisciplinary approach to environmental issues. It aims at developing students' awareness about the role that literature (both oral and written) can play in interrogating human actions that impact the sustenance of the environment. Emphasis will be given to the importance of interpreting and making sense of literature texts in terms of whether or not they inculcate environmental ethos. To this end, proverbs, folktales, riddles and traditional songs will be analysed for their environmental foci. A critical analysis of the value and relevance of indigenous knowledge systems to environmental sustainability will also be emphasised.

Let us now turn to the course on language and sustainable development. Upon completion of the course, students should be able to establish links between language and sustainability issues, and to challenge assumptions about the role of language in sustainable development (see, for example, ADEA, 1996; Mooko, 2009). The course gives students opportunities to critically explore links between language and sustainable development. To this end, the course will consider the language factor across the three spheres of sustainable development, namely environmental sustainability, sociopolitical sustainability, and economic sustainability. It is against this interpretation of sustainable development that the course will examine topics such as language and environmental education; language and gender inequality; language and poverty reduction; language and HIV/AIDS; and language, democracy and human rights.

Challenges and future outlook

One clear challenge to the curriculum innovation at the UB is the lack of appreciation of inter- and multidisciplinarity in some quarters of the university. This is what Ketlhoilwe and Jeremiah (2010, p. 8) meant by noting that "Academic staff members are closed in little boxes called 'areas of expertise and disciplines'". This has to be addressed if the institution is to make progress with the mainstreaming of environmental and sustainability issues in higher education. By developing language and literature courses and feeding them into and MEd Environmental and Sustainability Education, we are making a statement: that environmental and sustainability issues are for all disciplines: working in academic silos is no longer the way to go.

Another challenge is that the MEd programme has not yet been approved. There is a lack of adequate human resources, especially academics who specialise in environmental and sustainability issues. Additionally, the Department of Languages and Social Sciences Education does not have academics with competencies to teach in an inter-/multidisciplinary postgraduate programme. Otherwise, the demand for the MEd programme is high, and the Ministry of Education and Skills Development tops the list of prospective employers.

Summary and conclusion

The Change Project at the UB, in the form of curriculum innovation, involves the development of two courses to feed into a proposed MEd programme in Environmental and Sustainability Education. This innovation is taking place between two disciplines, Language Education and Environment Education, both of which are situated in the Department of Languages and Social Sciences Education in the Faculty of Education. This curriculum innovation is part of promoting dialogue between disciplines, one of the core principles of the United Nations' Decade of Education for Sustainable Development. The academic programme will live on after the end of the decade 2005-2014. We believe that the Change Project fulfils one of the long term objectives of MESA universities partnerships of building broad-based multidisciplinary capacity for responding to environmental and sustainability issues in African universities and the broader education system, which is influenced by universities.

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Chapter 27: Kigali Institute of Education Change Project: An Ongoing Process In ESD Innovation And Transformation Of Rwanda's Education Sector

Gaparayi Gaspard

(Kigali Institute of Education, Rwanda)

Abstract

Rwanda's economy and the livelihoods of the population are increasingly under pressure from unsustainable habits resulting in environmental degradation. The challenge for Rwanda is to use its natural resources to develop the economy, while at the same time protection the environment from impacts of pollution, climate change, and deforestation. Therefore, education should provide students with adequate skills and competences to live sustainably, bearing in mind that the young people are the hope of tomorrow. As the College of Education (CoE) trains teachers for secondary education, the Change Project within the college provides a good opportunity for improving ESD innovations in meeting development policies at all levels. This chapter describes the key activities of the Change Project undertaken in 2012. It focuses on the teaching activities in the module called EDF 101: Fundamental Life Skills for teachers delivered in level I for all college students. Workshops and mobilisation were also used to infuse ESD in young people. This has been done in close collaboration with Rwanda Environmental Management Authority (REMA) and other Higher Learning Institutions. At the end of the paper, key challenges are discussed that were met during the mainstreaming of ESD in our programmes, such as the lack of means and expertise. Our Change Project is an ongoing process as far as education and learning are concerned.

Background of the project

Rwanda is a small and landlocked country located in East Africa, with a population estimated at around 11 millions in 2013. Demographists estimate that Rwanda's population doubles every forty years, with a growth rate of 2.56%. There is a big contradiction between the demographic growth rate and economic capacity as far as life conditions are concerned. People are closely dependent on the ecosystem and environment as a first source of income (75% of Rwanda`s population are farmers). The economy and the livelihoods of the population are increasingly under pressure from unsustainable habits resulting in environmental degradation. Therefore, educating people about sustainable development becomes increasingly important as it provides people with the necessary skills, perspectives, values and knowledge to live sustainably. Here, curricula reforms and changes at all levels should play a leading role in initiating and implementing new programmes and scientific activities that should help to attain the Millennium Development Goals (MDG) as agreed upon at the World Summit on Sustainable Development (WSSD) in 2002.

Rwanda is currently embarking on a public university reform called *One University Plan*. Seven public institutions of higher learning are merged to form the University of Rwanda (UR). The objective of this reform is to increase efficiency and administrative harmonisation of Higher Learning Institutions (HLIs). This requires diverse means and methods to conserve and protect the acquired progresses, and to meet the challenges society is facing in development. In its mission of teaching, learning, research and community outreach, universities and HLIs must play a big role in promoting sustainable development considering their place in

research and modern education and the balance between education for sustainability and environmental sustainability. The College of Education (CoE, formerly KIE) Change Project aims to make a contribution towards these developments. Contacts were established in order to develop and implement a Postgraduate Diploma in ESD at CoE. While developing the specifics of the programme, we are also trying to create and develop a partnership with experienced universities, like Rhodes University. The CoE Change Project is part of SIDA's International Training Programme (ITP), which seeks to support creative thinking and development in the field of Education for Sustainable Development (ESD) in HLIs in Africa and Asia in general. The CoE Change Project is in line with the efforts by the United Nations Environmental Program (UNEP) to support the Global University Partnership on Environment and Sustainability (GUPES) initiative. It builds on and develops the work of the Mainstreaming Environment and Sustainable Development in African Universities (MESA) partnership and links to the Region Universities Consortium (RUC). The Change Project, entitled *Improving the Teaching of Environmental Education at Undergraduate Level in KIE: Efforts towards Sustainable Development,* is located in the Educational Foundations Department (EDF) in the School of Education. The current chapter describes the process we are engaged in and emphasises some of the challenges we meet in this process. It seeks to motivate stakeholders to remain committed to continuous collaboration and calls for mutual support.

Rationale for the Change Project

At tertiary level, HLI education is usually considered an important channel for sustainable development. That is why UNESCO, as a specialised UN organ in science, culture and education, has been mandated to spearhead the implementation of the Decade of Education for Sustainable Development, 2005-2014 (DESD), by providing support to governments to develop an international scheme accordingly. In Rwanda, national policy and planning processes have emphasised education as a central mechanism for economic and environmental transformation. Thus, the role of ESD is widely acknowledged in this country.

It is now our responsibility, as Rwanda`s HLIs, to contribute to the strengthening of the existing partnerships in achieving national development objectives for the future of our population. Thus, as identified by the Southern African Development Community (SADC), ESD must be a priority intervention area to achieve socioeconomic progresses as recommended by the MDGs. Here, a key activity is to develop human capacity building and training programmes for sustainable development in general, and that of teacher education training in particular. Therefore, institutions of teacher education like the College of Education fulfil a vital role in the global education community. They have the potential to bring changes to the education systems that will shape the knowledge, attitudes and skills of future generations. Education is often described as the great hope for the creation of a more sustainable future, and teacher education institutions serve as key change agents in transforming societies, so that such a future is possible.

Change Project objectives

In the College of Education, ESD initiatives have provided a good opportunity to learn, exchange, deliberate and decide on what has been achieved in the last decades, but also on what should be initiated in the field of Environmental Education in the future. This is critical in mobilising all schools within the college to embrace a holistic approach and a concerted effort towards fulfilling sustainable development. The objectives of the Change Project are as follows:

- encourage innovation based training, research and management and clearly define the potential role of education in ESD innovation;
- highlight the relevance of sharing innovation through communication, cooperation or networking and partnerships;

- evaluate and advise on what should be done to overcome the key obstacles that emerged during our Change Project;
- translate the action plan, agreed on during the 5th phase workshop, progressively in concrete actions;
- implement the Change Project through teaching and workshops

Implementation of the project

The Change Project was developed and implemented from March 2013 by the Educational Foundations Department (EDF) located in the School of Education. It supplements the teaching process of all subjects related to fundamental life skills for teachers as a crosscutting theme taught to all level I students within the college. Basically, Life skills education is premised on the fact that modern life is a formidable challenge, especially for young learners who need to be equipped at an early stage with constructive skills to face the rigours of social and academic life. Furthermore, learners, especially student teachers, need to be made conscious of life skills, since these play crucial roles in the physical and emotional development of learners. The life skills module of the Environmental Education course covers academic study skills as well as social, economic, political, and environmental skills that are crucial for responsible livelihood in society. The core ESD elements of this block are captured in the following topics:
- definition of environment;
- human activities that pollute and destroy the environment;
- pollution and global warming; and
- international agreements and their recommendations on the protection of environment.

The Rwanda Education Board focussed on the following key themes in the curricula review process:
- defining Environmental Education;
- a global perspective on Environmental Education;
- waste management;
- climate change; and
- social injustice regarding its divisions of rewards and burdens and other incidental inequalities.

Each key theme is covered in the Environment Education course by multiple subthemes. For example, the topic of waste management covers the following:
- introduction to waste management;
- minimum requirements for the handling, classification and disposal of hazardous waste, waste disposal by landfill;
- recycling and resource management; and
- waste prevention, minimisation and optimisation.

Fundamentally, the ESD block aims at providing all level I students of our college with the following knowledge and skills:
- Awareness of environmental issues so that they may prevent the destruction of environment and take measures to protect it.
- Definition of environment, examples of human activities that pollute and destroy the environment, processes of destruction, pollution, global warming, protection of environment and recommendations from international agreements.
- Being able to explain environmental patterns and their relation to human activities.
- Identify human activities that may promote or destroy environment.
- Show areas and activities that are concerned with environmental issues and studies.
- Be aware of and applying the recommendations from international agreements.

Mobilisation of student ESD clubs

Besides the development of an ESD block within the Environmental Education course, ESD student clubs have been mobilised in the College of Education (CoE). The visibility of the existing clubs has been reinforced and their members have been participating in workshops organised either by the CoE academic staff or jointly with our stakeholders, namely REMA and other HLIs. The workshops aimto generate knowledge on ESD related issues and hopefully generates sufficient commitment from the students to advocate ESD during their time outside of the College in internships andduring their educational career after the completion of their studies.This of course will also enhance the community involvement through prolonged actions and advocacy of ESD within the whole country, considering students as actors of social change mobilisation. Their actions constitute a platform of change, exchange and deep understanding wherever they will live.

Conclusion

The Government of Rwanda has developed several resource materials for ESD public awareness and advocacy. In the ministry of Education's Education Sector Strategic Plan 2008-2012 (ESSP), ESD is taught at Primary Education level in Science and Elementary Technology, while in Secondary Education, it is taught in Geography and General Papers. Furthermore, civil society has been in the frontline on strong campaign in EESD infusing social justice, environmental management, and economic growth. The ongoing project should be understood in this context. Furthermore, Rwanda is a signatory partner to universal conventions and agreements including DESD, ending next year, in economic spheres of sustainable development. Thus, it is in its responsibility to implement all these rules, laws and regulations. What should be done through policy formulation, resource material development, capacity building, vision-building, partnership and networking etcetera. Indeed, the joint report DFID, European Commission, UNDP and World Bank, *Linking Poverty Reduction and Environment Management,* asserts that environment is important in such a way that it is correlated to health, economic growth, agriculture, commerce and industries, infrastructure, culture and values in large. In fact, the main pillars of EESD are environment, economy, heart and mind, and finally culture. At the CoE level, for example, student environment clubs were formed with the core objectives of protecting the environment by, for example, making our campus green. To achieve its goals have to mobilise and sensitise the College community, at an academic as well as an administrative level. Specific actions that emerged from this process are the greening the campus landscape and gardens, which had been miss-used; raising awareness on the proper use of dustbins; and helping to develop rules and regulations to ensure environmental protection, for example by creating of footpath towards the garden chairs to ensure proper maintenance of the green environment.

The chapters in this book are written by academics involved in the Mainstreaming of Environment and Sustainability in African (MESA) Universities Programme. The MESA programme involved change agents from universities in 35 countries in Africa. All participating in the production of this book recognize that for a more sustainable and just society to emerge, local ownership and development of practices that engage with complex sustainability concerns in a myriad of diverse context are needed.

Many of the Stories of Change in this book were conceived and initiated with support from the International Training Programme in Higher Education for Sustainable Development, a programme implemented by Natura in partnership with support from Sida and the United Nations Environment Programme (UNEP). UNEP have hosted the MESA programme as part of their Global Universities Partnership Programme for Environment and Sustainability.

In participating universities, the ITP has seeded the development of over 100 different change oriented initiatives or 'change projects' that have contributed either to curriculum innovation, policy development, community engagement or research, with each one collectively contributing to the transformation of education in Africa. This book carries some of these 'Stories of Change'.