

A Masters-Level Degree Programme to Support the Development of a Sustainable and Socially Responsible Minerals Industry in Africa

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Abstract

This paper describes a trans-disciplinary and inter-institutional Master of Philosophy (MPhil) degree programme aimed at generating professionals who have an overall understanding of the complex sustainable challenges facing the minerals industry and society in Africa, a sensitivity on how to project such in the context of different stakeholders, as well as the ability to develop the knowledge required to address these challenges through research. This unique and innovative programme targets graduate professionals from across a spectrum of disciplines, including geologists, engineers, planners, strategists, lawyers, regulators, health professionals, safety specialists, environmental officers and social scientists, and was developed as part of the Education for Sustainable Development in Africa (ESDA) project of the United Nations University Institute for Sustainability and Peace (UNU-ISP). It is delivered on a decentralized basis by two African universities (University of Cape Town-Cape Town and University of Zambia-Lusaka, based upon a common set of course instructions. Students are required to complete advanced study by coursework, an internship, and a research dissertation which will account for 67% of the total credits for the degree. Hosted by the Minerals to Metals (MtM) Initiative at the University of Cape Town, this programme has created a unique platform for developing trans-disciplinary skills and approaches for addressing the sustainability challenges facing the minerals industry sector. It is expected that future decision makers will come from this platform and be equipped to realise the promise of Africa.

Keywords

Master of Philosophy, sustainable mineral resource development, strategic social engagement, environmental stewardship, research communication & methodology.

Introduction

Minerals and metals are essential for modern life and their reliable and responsible supply is critical to maintain and develop a sustainable world. However, their extraction and beneficiation has significant negative environmental impacts such as the contamination of water, air and land resources with toxic by-products from their processing (WRI, 2014). These impacts not only affect local communities, but also pose a management and economic challenge to mining companies and regulatory agencies (WRI, 2014). There is growing pressure from governments and local communities for the mining industry to improve on its environmental and social performance by adopting sustainability principles in minerals and metals production (WEF, 2014). The so called 'licence to operate' of many mining companies is under threat, as they struggle to operate in fast changing environment of increased government environmental regulation and an increased demand for greater stakeholder engagement in decision making (Citufani, 2013; KIN, 2014; Lane and Ndlovu, 2012) . The work that lies ahead requires many knowledgeable individuals capable of working in increasingly complex environments (Veiga and Tucker, 2014).

As highlighted by Broadhurst et al. (2016), a sustained programme of research and human capacity development in the context of the extraction and processing of mineral resources in Africa is critical in ensuring that the mining sector continues to thrive and contribute to socio-economic development in a manner consistent with sustainability principles. A master's degree in an aspect of sustainable development, completed in a multi-disciplinary class, is fast becoming the standard entry point for employment in this dynamic and richly challenging field. To this end, a new post-graduate degree programme, Master of Philosophy (MPhil)

specializing in Sustainable Mineral Resource Development, was developed by a team of academics from both the Minerals to Metals (MtM) Initiative at the University of Cape Town (UCT) and the School of Mines at the University of Zambia (UNZA). Inaugurated in 2014, this programme was conceptualised as one of the offerings of the Education for Sustainable Development in Africa (ESDA) consortium of eight African universities and the United Nations University for Sustainability and Peace (UNU-ISP) in Tokyo. This research-based programme is delivered on a decentralized basis by two African universities, viz. the University of Cape Town (Cape Town, South Africa) and the University of Zambia (Lusaka, Zambia), and is currently attracting students from around the world.

Programme Objectives

The MPhil programme is designed to produce meaningful targeted research outcomes, while generating highly skilled “T-shaped” professionals (Brown, 2015), who have the necessary depth and breadth of knowledge to lead the minerals sector in a more sustainable future world. Through this programme, these individuals will be able to combine a good integrated understanding of the critical issues involved in developing mineral resources sustainably, with a sensitivity on how to project such in the context of different stakeholders. More specifically, the programme aims to:

- Impart a high-level understanding of, and a sensitivity and progressive approach to, the critical factors of sustainable development in the context of mining and metals in Africa.
- Develop an appreciation of the inter-relationships between safety, health, the environment, economic development and proactive stakeholder management, and the concomitant integration of technical skills, ethics and global citizenship.
- Promote experimentation with inter-disciplinary and systemic approaches to environmental protection and socio-economic development in the context of geo-extractive industries in Africa.

Programme Curriculum

The programme comprises four core course modules (Table 1). In line with the trans-disciplinary and inter-institutional nature of this programme, these courses are delivered across four different faculties at three different academic institutions. Core courses are delivered in blocks of approximately 10 days each within the first year of study, with attendance by the entire cohort of students from the two universities (UCT and UNZA) involved. Course assignments are presented via on-line learning systems, and contact with the students maintained via the internet and e-mail.

In addition to coursework, students are required to undertake a non-credit bearing field-based internship which entails structured engagement with a real problem in the developmental setting of a host organisation. In addition, each student is required to complete a dissertation, typically incorporating a research project of a theoretical or practical nature, in one or other of the areas covered by the core courses. As the research component comprises 67% of the total credits, this degree programme is accredited as a research degree with a smaller, albeit crucial, taught component.

Table 1: Course list of the Master of Philosophy (MPhil) specializing in Sustainable Mineral Resource Development. In accordance with the South African Higher Education Qualifications Framework (HEQF) model, 10 hours is equivalent to 1 credit, with contact/lecture time accounting for approximately 1/5 of total time.

Course Description	Convening Institute	Credits
Introduction to Sustainable Development	Sustainability Institute, University of Stellenbosch	16
Strategic Social Engagement Practice	GSB, UCT	16
Environmental Stewardship in Mining & Minerals Beneficiation	School of Mines, UNZA, and Faculty of Engineering and Built Environment (EBE), UCT	12

Course Description	Convening Institute	Credits
Research Communication & Methodology	EBE Faculty, UCT	16
Sustainable Development in Africa Internship	EBE Faculty, UCT	0
Master's Dissertation	EBE Faculty, UCT	120

Core Courses

Introduction to Sustainable Development

This is an existing Master's level course convened by the Sustainability Institute at the University of Stellenbosch, South Africa. The aim of the course is to provide course participants with an overview of the most significant global environmental, social and economic challenges that face humankind, and an insight into the solutions suggested by the universal commitment to sustainable development. The key questions that guide the lectures and discussions are:

- What does sustainability – and sustainable development in particular – mean?
- What is the relationship between inequality and unsustainability? Or, alternatively, what is the relationship between strategies to reduce inequality (via poverty eradication for the poor and consumption reduction for the rich) and sustainable development?
- What is the relationship between human life and all life forms and how has this relationship evolved over time?

The course combines classroom work, a group project for completion during the week, written assignments, personal reflection, and practical involvement in local community projects.

Strategic Social Engagement Practice

This course is convened by Elspeth Donovan of the University of Cambridge Institute for Sustainable Leadership on behalf of the UCT Graduate

School of Business (GSB). The course is delivered largely through lectures, interactive sessions and group work, and is followed by a project task in which each student is required to apply the tools and practices developed in the course into their daily work practice.

The aim of the course is to enable students to make sense of the social and environmental context of organisations and to understand the mutual interaction between, and the impact on, the organisation and its social and environmental context. The course also aims to teach the students how to engage with and manage relationships between an organisation and the communities and other social partners that populate its context, and to develop and implement strategic social engagement programmes and practices. This course is designed to build the capacity of all managers and professionals in organisations to respond effectively and innovatively to emerging system pressures and trends affecting the socio-economic development agenda.

Environmental Stewardship in Mining & Minerals Beneficiation

This course is convened jointly by the Department of Chemical Engineering at the University of Cape Town and the School of Mines at the University of Zambia. The course provides students with exposure to the mining world and offers them the opportunity to conduct case studies on real mine sites. Students are required to complete an assignment within 6-8 weeks of attendance.

The course aims to review and deepen students' understanding of environmental challenges of particular relevance to the mineral industry, with emphasis on the relationship between mining and minerals beneficiation activities and environmental impact categories. It also provides students with an opportunity to learn how environmental management and stewardship tools and approaches are used in the industry, leading to an ability to critique the effectiveness of pro-active and reactive uses thereof, and interpret what selected approaches mean for own professional practise.

Research Communication & Methodology

This course is convened by the Department of Chemical Engineering at the University of Cape Town. The course is delivered largely through lectures, tutorials and seminars, with reading assignments, group work, and projects forming a core part of the learning environment. This course is delivered in discrete modules which are integrated into the overall course programme in such a manner that the students develop their research skills and research project scope in parallel with their learnings from the other courses. This course aims to provide the students with competency to execute meaningful research in a structured way, to critically analyse the results of this research, and to communicate these results effectively. This course also focuses on integrating the knowledge gained from the taught courses outlined above, and on the application of this integrated knowledge to the understanding and resolution of selected problems in the context of sustainable mineral resource development.

Sustainable Development in Africa Internship

This is a non-credit bearing course that is grounded in the realizations that sustainable development requires professionals to be able to negotiate disciplinary truth boundaries so as to minimize externalization of costs and damages to 3rd parties or future generations. In addition this course gives the students an understanding of the complexity of coupled social-ecological systems, which can only partly be learnt in the classroom. The course aims to facilitate field-based inter-disciplinary learning especially through on-site structured engagements with problem-solving approaches in the actual developmental setting of the host organization, and to provide an opportunity to experience possible career options in the area of sustainable development.

Research Dissertation

The research proposal is developed within the first year of study, and research largely undertaken within the second year of study through the respective universities. Inter- and trans-disciplinary research is promoted

through the joint supervision of student dissertations across faculties and research groupings. Current research topics cover aspects of mine closure planning and rehabilitation of degraded mine land; performance analysis & policy - making for mineral value chains; entrepreneurship in communities around the mining & minerals beneficiation; systemic approaches to mining accident causality analysis; legal frameworks for mitigating environmental and social impacts; the downstream use of mine wastes; gender equality in mining; and the reconciliation of different stakeholders.

Student Recruitment and Admission

This programme targets graduates from across a spectrum of disciplines, who have an interest in pursuing or advancing their careers in the field of mining and minerals beneficiation in a variety of areas e.g. geologists, engineers, economists, planners, lawyers, regulators, health & safety specialists, environmental officers, social scientists, etc. The basic entry requirement is a four-year Bachelor's degree or an Honours degree in any relevant field. The number of students accepted into the programme in any year is restricted by the resource capacity of the programme for that particular year. Selection is based on an applicant's academic record and relevant work experience. In keeping with the inter- and trans-disciplinary nature of this programme, selection is also be aimed at promoting diversity amongst the students in terms of fields of study, expertise and/or experience.

Programme Implementation and Outcomes

The programme was inaugurated in 2014 and, by the end of 2016, comprised 36 students, 21 of whom were enrolled at UCT and 15 at UNZA. This cohort represents a number of disciplines (including engineering, forestry, law, economics, psychology, social science), and countries (South Africa, Zambia, Zimbabwe, Malawi, Australia and Japan). Many of these students hold middle to senior management positions in government, mining houses, consultancies and in their communities. Others are recent graduates studying full time. This diversity has helped to enrich the learning experience and made for many inspiring classroom discussions and activities. Workshops with student cohorts at the end of their first

year of coursework, have indicated that students have developed an enhanced appreciation for the complexity of sustainable mineral resource development, the challenges associated with different stakeholders, as well as the need for value-based leadership and governance. The students also show a deeper understanding of, and tolerance for, the perspectives and viewpoints of their colleagues from different disciplines, and have emphasised the extent to which the programme has increased their self-awareness. This is both in terms of their personal attributes and beliefs, as well as their potential capacity to contribute to the society in which they function. This understanding and knowledge has not only underpinned their research projects, but also influenced the day-to-day functioning in their workplace.

The academic staff involved with this programme have also benefitted through engagement with academics from other disciplines and external stakeholder organisations. The programme has thus generated a number of new research areas and collaborative partnerships, both internal and external to the university.

Future Perspectives

The mining and minerals industry faces some of the most difficult sustainability challenges of any industrial sector. To secure its continued 'social licence' to operate, the industry must respond to these challenges by engaging its many different stakeholders and addressing their sustainability concerns, as well as by adopting sustainability principles in their operations. The Master of Philosophy (MPhil) specializing in Sustainable Mineral Resource Development programme is a step towards developing and equipping future leaders with the capacity to meet these challenges by developing skills and knowledge that can be used by all stakeholder.

It is, furthermore, envisaged that the benefits gained from this experience are likely to extend beyond the mining sector through the development of trans-disciplinary research capacity for solving complex sustainability problems in general, as well as practical guidelines in how such research should be practiced.

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