QUALIFICATION SPECIFICATION							
							SECTION A
QUALIFICATION DEVELOPER	Botswana International University of Science and Technology						
TITLE	Bachelor of Science Honours in Earth and Environmental Sciences			**NCQF LEVEL**	8		
FIELD	Natural, Mathematical and Life Sciences		**SUB-FIELD**	Earth and Environmental Science			
New qualification	✓	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET		Higher Education	✓	
QUALIFICATION TYPE	Certificate		Diploma		Bachelor		
	Bachelor Honours	✓	Master		Doctor		
CREDIT VALUE 132							

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

The Earth's environment and its natural resources are important for human well-being. It is inevitable that livelihoods as well as other ecosystems depend on the environment and its natural resources. However, if mankind continues to overexploit the earth's resources, there may be irreparable consequences that can negatively affect the survival of future generations. Botswana's economy is largely based on mineral resources [1] while most rural livelihoods depend on rainfed agriculture. There has been a surge in demand for the use of natural and mineral resources with increased developmental needs. Thus, depletion of natural resources and impairment of the Earth's natural system processes are becoming a cause of global concern. Issues emanating from mineral and natural resource exploitation, disposal of industrial and municipal wastes and their negative impact on preservation of groundwater supplies as well as climate change have compounded effects on the availability and sustainable use of Earth's natural resources. To

promote sustainability and development it is necessary to understand the synergistic relationships between the environment and its resources, earth system processes and human interactions. This will in turn provide sustainable solutions to environmental problems aimed at improving the quality of life of humans and the ecosystem at large. It is also important to understand the occurrence and nature of mineral resources in order to make informed decisions on the modes of mineral extraction and environmental conservation. A critical understanding of the processes that sustain environmental systems, how these systems function and interact with each other and with human society requires human skills at the appropriate level. Botswana therefore needs skilled personnel in Earth and Environmental Sciences that will drive sustainable development of the country's economy [2] particularly with respect to natural resource exploitation [3].

The degree in Earth and Environmental Sciences is aimed at producing skilled human resources that will oversee the sustainable development of Botswana's economy. The program explores the earth's structure, the processes of plate tectonics, energy transformation, the formatting and cycling of water and nutrients and human-environmental interactions. It is emphasized on education and awareness about the natural environment and its resources, the impact of human activities on natural systems and environmental conservation. Reports show that there is a growing shortage of skilled manpower who can translate scientific knowledge into actions that can manage resources sustainably [4] for the future generations. Thus, this training in Earth and Environmental Sciences is increasingly becoming an important discipline in many universities worldwide. The BSc Honours degree in Earth and Environmental Sciences is designed to prepare individuals for careers in various sectors such as environmental consulting, water resources, agriculture, mining industry, energy, commerce, health as well as in various organs of government.

PURPOSE:

Botswana needs now, more than before people who are trained to properly manage environmental resources particularly under the context of sustainability, development, climate change and other environmental hazards. The graduates will be equipped with problem-solving and critical thinking skills that will enable them to carefully analyse potential environmental problems and come up with carefully thought out mitigations and environmental management strategies.

Graduates of this qualification will be able to:

- Apply highly specialized knowledge and skills of the Earth and Environmental Science in natural resource use, conservation, development and sustainability of the Earth's natural resources.
- Demonstrate advanced specialist knowledge of the synergistic interactions between the geosphere, hydrosphere, atmosphere, and biosphere.
- Apply advanced and practical skills of field work methods to acquire detailed geological data and locate natural resources in the earth's crust.
- Identify points of interventions in case of environmental resources problems.
- Implement sustainable mitigation strategies to environment and natural resources management.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum Entry Requirements are

a) Bachelor Degree, NCQF level 7.

b) Applicants who do not meet the above criteria but possess relevant industrial experience may be considered through the Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) policies for access. This consideration will be done following guidelines of the Education and Training Providers (ETP) in line with BQA/ National policies.

QUALIFICATION SPECIFICATION	**SECTION B**
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Graduates of this program will be able to:	Direct way of assessment aimed to test the capacity to:
LO1 Demonstrate highly specialized knowledge and understanding of the earth system pathways and their	1.1 Explain to stakeholders the interactions between the different spheres of earth system

interactions with each other including anthropogenic activities	in relation to natural resource functions, and sustainability. 1.2 Recommend sustainable use of natural resources 1.3 Create awareness of environmental conservation 1.4 Enforce a mentality of equitable distribution and use of resources
LO2 Demonstrate understanding of contemporary theories and processes that affect evolution, diversity, structure, and composition of the Earth	2.1 Explain to clients in mining and natural resource sectors the processes that affect the Earth and their relationship through the paradigm of plate tectonics. 2.2 Describe and explain chemical and structural properties of minerals. 2.3 Assist clientele to identify different types of rocks, their genesis, occurrence, distribution and uses 2.4 Explain to clientele the specialized knowledge of life, the theories of origin and evolution of life and the current body of knowledge on the interaction of humans and the natural environment.
LO3 Apply advanced specialist knowledge of the sustainability and development concepts when solving complex environmental problems	3.1 Explain to clientele, project developers, and communities the importance of sustainable development on social, economic, and environmental resources. 3.2 Perform a cost benefit analysis of economic and social development vis a vis environmental sustainability for proposed projects.

	3.3 Plan sustainable use measures 3.4 Implement sustainable strategies for natural resource use 3.5 Evaluate the effectiveness of recommended strategies.
LO4 Demonstrate in-depth understanding and capability to use various concepts in sustainability science, systems analysis, natural resource conservation and measures for enhancing perspectives of environmental and sustainable development.	4.1 Utilize the multidisciplinary approach in planning appropriate developmental strategies that will enhance efficient resource utilization and sustainability. 4.2 Develop environmental conservation and protection plans 4.3 Formulate sustainable strategies of resource reuse, recycling and minimised resource use 4.4 Execute comprehensive, strategic and sustainable resources and land-use development strategies for projects that promote economic development with wise use of environmental resources 4.5 Evaluate the performance and success of implemented strategies and improve them where necessary.
LO5 Use high level and specialised knowledge in Earth and Environmental Sciences to conduct, evaluate and critically analyse research outputs in natural resources conservation and sustainable development in compliance with legislated and ethical research principles.	5.1 Identify and synthesize problems related to natural resources and sustainable development. 5.2 Implement sound research techniques in formulating hypotheses; objectives; methodologies for research and development programs in resource utilization, maintenance, and sustainable development.

	5.3 Gather and interpret reliable data using appropriate scientific tools. 5.4 Formulate up to date and practical recommendations based on research results. 5.5 Prepare and package comprehensive report. 5.6 Effectively Communicate the research findings to relevant audiences.
LO6 Apply specialised knowledge of the principles of environmental protection and contemporary theories of sustainability to perform in-depth environmental impact assessments for proposed projects.	6.1 Conduct scoping and base-line analysis of the current environment prior to any development projects. 6.2 Conduct interviews and consultations with stakeholder communities to inform them about anticipated impacts of proposed developments in their area. 6.3 Predict and quantify the environmental impacts. 6.4 Propose mitigation measures to alleviate current and future environmental problems. 6.5 Implement localized sustainable mitigation strategies. 6.6 Perform an audit compliance of the mitigation measures

QUALIFICATION STRUCTURE			**SECTION C**
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	Global Environmental Change	**8**	**12**

CORE COMPONENT Subjects / Units / Modules /Courses	Pedology and Land Evaluation	**8**	**12**
	Environmental Pollution, Remediation and Management	**8**	**12**
	Computational, Statistical and Research techniques for Earth and Environmental Sciences	**8**	**12**
	Exploration and Evaluation of Minerals	**8**	**12**
	Cratons, Kimberlites and Diamonds	**8**	**12**
	Research Project I	**8**	**18**
	Research Project II	**8**	**18**
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	Elective 1 (Specialization 1)	**8**	**12**
	Elective 2 (Specialization 2)	**8**	**12**
	List of Elective Modules (Choose 2)		
	Satellite Meteorology	**8**	**12**
	Atmospheric Thermodynamics	**8**	**12**
	Environmental Risk and Management	**8**	**12**
	Environmental Degradation and Pollution Control	**8**	**12**
	Geological Hazards	**8**	**12**
	Economics of Resource Utilisation and Management	**8**	**12**
	Soil Biogeochemistry	**8**	**12**
	Integrated Water Resources Management	**8**	**12**
	Water Quality	**8**	**12**
	Hydrogeology and Water Resources	**8**	**12**
	GIS for Environmental Applications	**8**	**12**
	Environmental Remote Sensing	**8**	**12**
	Environmental Change: Society and human dimensions	**8**	**12**
	Geology	**8**	**12**

Rules of combinations, Credit distribution

Fundamentals (1): Level 8: 12 credits

Core modules (7): Level 8: 96 credits

Elective modules (2): Level 8 24 credits NQCF Level 8 = **132 credits**	

MODERATION ARRANGEMENTS
Formative assessment Formative assessment or continuous assessment (CA) contributing towards the award of credits shall be based on course outcomes. This can include tests, assignments and projects as well as simulated and real work settings. The overall weighted contribution of formative assessment to the final grade shall be 40%. ***Summative assessment*** Candidates may undergo assessment including written and practical and simulated projects. The final examination for each course contributes 60% of the final mark for that course. In addition, there will be internal and external moderation for the qualification. Assessors and moderators must be BQA registered and accredited. Both internal and external moderation will be done in-line with the moderation policy of the Institution. **Moderation** This qualification must be moderated internally and externally for quality assurance purpose. Moderators and assessors must be registered and accredited by BQA. The details of moderation and assessments processes shall apply as per the individual ETP policies in line with the BQA or national policies
RECOGNITION OF PRIOR LEARNING (if applicable)
Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment for the award of credits towards the qualification in accordance with applicable RPL policies and relevant national-level policy and legislative framework. Implementation of

RPL shall also be consistent with requirements, if any, prescribed for the field or sub-field of study by relevant national, regional or international professional bodies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Articulation

- Bachelor of Science Honours in Geology
- Bachelor of Science Honours in Environmental Science
- Bachelor of Science Honours in Atmospheric Sciences
- Bachelor of Science Honours in Natural Resources Management and Conservation
- Bachelor of Science Honours in Soil Science

- Post-Graduate Diploma in Environmental Planning and Sustainable Development
- Post-Graduate Diploma in Land use planning
- Post-Graduate Diploma in Ecohydrology
- Post-Graduate Diploma in Integrated Water-Resources Management
- Post-Graduate Diploma in Climate change and Mitigation
- Post-Graduate Diploma in GIS and Remote Sensing of the Environment
- Post-Graduate Diploma in Integrated Waste Management
- Post-Graduate Diploma in Environmental safety and HealthPost-Graduate Certificate

- Post-Graduate Certificate in GIS and remote sensing application
- Post-Graduate Certificate in Environmental Impact Assessment
- Post-Graduate Certificate in Environmental Audit and Compliance

Vertical articulation

Master of Science: NCQF level 9

- Master of Science in Earth Sciences
- Master of Science in Environmental Science
- Master of Science in Resource Utilisation and Management
- Master of Science in Environmental Policy and Planning
- Master of Science in Environmental Geology
- Master of Science in Land Use Planning and Development

Employment pathway

- Environmental Consultants
- Resource Valuation and Development Experts
- EIA practitioners
- Water Resource Planners
- Geo-Environmental Scientists and Researchers
- Specialist Environmental Advisor
- Academics in Earth and Environmental Sciences

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award. To obtain the Bachelor of Science Honours in Earth and Environmental Sciences the student must obtain a minimum of 132 credits and satisfy all the rules of combination as indicated above.

Certification - Candidates meeting prescribed requirements will be awarded a certificate.

REGIONAL AND INTERNATIONAL COMPARABILITY

The rationale of this Bachelor of Science Honours in Earth and Environmental Sciences is similar to the other universities used for comparison; however, it also has stronger emphasis on environmental sustainability. Compared to other universities this qualification only has one fundamental course but more in-depth and specialized core courses and electives and research project which spans the entire duration of the qualification. The qualification is unique in that specific emphasis is placed on providing advanced knowledge and skills on the resource utilization and environmental impacts for countries such as Botswana where the economy depends mainly on mineral resources.

Although the qualifications examined are all for the Bachelor of Science Honours in Earth and Environmental Sciences the new honours qualification is covered in one year i.e. level 8, while for other universities it is combined with lower levels i.e. year 1 to year 4 wherein year 4 is the honours concentration. Therefore, comparison was based on the year 4 components from other universities. Also, there is a variation in number of credits allocated to the modules.

This qualification is unique in that there is no university locally and regionally especially in Africa that was found offering subject combination of Earth and Environmental Sciences like this qualification. This qualification has, therefore, been benchmarked against BSc Honours in Earth and Environmental Sciences offered from the UK, USA, Germany, and Canada. The qualification, generally, compares well with the qualifications studied since the exit outcomes cover similar scope and depth and are aligned to exit-level descriptors typical of this level and type of qualification as well as competencies required for registration and accreditation with professional bodies such as the Higher Learning Commission (HLC).

REVIEW PERIOD

5 years