SECTION A:	QUALIFICATION DETAILS																		
QUALIFICATION DEVELOPER (S)	University of Botswana																		
TITLE	Bachelor of Science in Environmental Science															**NCQF LEVEL**	7		
FIELD	Natural, Mathematical and Life Sciences		**SUB-FIELD**	Environmental Science												**CREDIT VALUE**	480		
New Qualification	√		Review of Existing Qualification																
SUB-FRAMEWORK	General Education		TVET													Higher Education	√		
QUALIFICATION TYPE	Certificate	I		II		III		IV		V		Diploma		Bachelor	√				
	Bachelor Honours		Post Graduate Certificate									Post Graduate Diploma							
	Masters											Doctorate/ PhD							

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

Environmental Science is a multidisciplinary subject concerned with facilitating the understanding and management of the complex interactions of natural processes, the biophysical environment ,and human activities, with emphasis on achieving sustainable development in general and environmental sustainability in particular. As per the Botswana National Human Development Strategy 2009-2022, Botswana is diversifying from a resource-based to a knowledge-based economy. In this regard, the country has adopted an explicit strategic and sustained build-up of relevant human resources capacity within the framework of sustainable

development in all its economic, social, and environmental dimensions. Based on experience and interactions with stakeholders, it is obvious that there is still great interest in the environment and its sustainability. Practitioners in the field of environment require that prospective employees be knowledgeable about contemporary issues, such as climate change and be equipped with modern methods and techniques of environmental assessment, monitoring, and management. There is increasing emphasis on computer, quantitative and qualitative skills, systems of geospatial analysis, particularly remote sensing, and geographic information systems. These stakeholder/practitioner perspectives were the foundations of this (current) qualification.

PURPOSE:

The purpose of this qualification is to produce graduates with knowledge, skills, and competences to:

- Integrate biophysical and socio-economic environmental processes and issues.
- Demonstrate knowledge and understanding of the necessity for integrated biophysical and socio-economic environmental processes to meet the national and global sustainability agenda.
- Apply advanced knowledge in research within the key areas of sustainable development and environmental sustainability.

ENTRY REQUIREMENTS (including access and inclusion)

The entrance requirements to the BSc degree shall be:

- NCQF Level 4.
- Recognition of Prior learning (RPL) for entry will be in line with the Institutional and National policies.

SECTION B	QUALIFICATION SPECIFICATION
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
1.1 Demonstrate knowledge and understanding in environmental science that incorporates an integrated (bio-physical and human environment) approach at a range of spatial and temporal scales.	1.1.1 Interpret theoretical and field-based assessment of key Biophysical and Human environmental issues and problems at a variety of spatial and temporal scales using an integrated approach. 1.1.2 Compile quality and information on emerging contemporary environmental issues necessary for sustainable development. 1.1.3 Analyze environmental problems at different spatial and temporal scales.
1.2 Demonstrate knowledge and understanding in using the integrated biophysical and socio-economic environmental processes within the policy requirements at global (i.e., UN sustainability agenda), regional (i.e., SADC) and local (i.e., vision 2036) scales.	1.2.1 Apply knowledge to analyze key policies at global, regional, and local scales. 1.2.2 Apply knowledge to evaluate how and why the key policy requirements have changed over time.
1.3 Apply skills and techniques relevant to environmental science for investigating environmental processes and functions necessary for the attainment of sustainable development.	1.3.1 Apply an array of techniques for the collection and analysis of environmental data at different spatial and temporal scales. 1.3.2 Generate appropriate environmental information and recommendations, especially to inform

	decision making processes in sustainable development. 1.3.3 Work effectively in a team and as an individual on complex natural resource problems that require holistic problem-solving approaches.
1.4 Use relevant qualitative and quantitative techniques in assessing the suitability of proposed theories and hypotheses.	1.4.1 Apply suitable quantitative statistical techniques that suits both the nature of data collected and the research questions to be answered. 1.4.2 Apply suitable qualitative techniques complementarily or as an alternative technique that suits both the nature of data collected and the research questions to be answered.
1.5 Apply knowledge of technical vocabulary, central analytical concepts, and methods of enquiry appropriate to the study of Environmental Science.	1.5.1 Demonstrate knowledge, technical skills, and vocabulary to investigate and analyse changing themes, trends, arguments, and challenges within the area of environmental sustainability and how it can best be attained. 1.5.2 Demonstrate knowledge and understanding of current research on drivers of environmental change (i.e., climate change), their trends, resultant impacts, and their policy implications.
1.6 Undertake an independent and/or group study within the field of environmental science and communicate the results to a diverse array of stakeholders.	1.6.1 Design and conduct scientific research on a particular aspect of an environmental issue relevant to sustainable development. 1.6.2 Design and implement a self-initiated piece of research in line with scientific, methodological, and ethical guidelines. 1.6.3 Produce scientific reports and informative presentations on aspects of environmental sustainability.

	1.6.4 Effectively communicate information on environmental change and variability at a range of spatial and temporal scales to solve environmental problems.

SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	**TITLE**	**Credits Per Relevant NCQF Level**			**Total** (**Per** Subject/ Course/ Module/ Units)
		Level [5]	**Level [6]**	**Level [7]**	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units					
	Earth Systems and Processes	**12**			**12**
	Quantitative Techniques in Environmental Science I	**12**			**12**
	Environmental Issues & Controversies	**12**			**12**
	Computer Skills Fundamentals I	**12**			**12**
	Communication and Academic Literacy Skills I	**12**			**12**
	Human Environment Systems and Processes	**12**			**12**

	Quantitative Techniques in Environmental Science II	**12**			**12**
	Sustainable Development & Global Change	**12**			**12**
	Computer Skills Fundamentals II	**12**			**12**
	Communication and Academic Literacy Skills II	**12**			**12**
	TOTAL	**120**			**120**
CORE COMPONENT Subjects/Courses/ Modules/Units					
	Natural Resources Management		**12**		**12**
	Research Methods in Environmental Science		**12**		**12**
	Introduction to Spatial Analysis		**12**		**12**
	Environmental Hazards and Disaster Management		**12**		**12**
	Environment and Agriculture		**12**		**12**
	Human Impacts on the Environment		**12**		**12**

	Introduction to Remote Sensing		**12**		**12**
	Botswana Environment		**12**		**12**
	Globalization, Development and Environmental Change		**12**		**12**
	Environment and Population Dynamics		**12**		**12**
	Environmental Sustainability			**12**	**12**
	Sustainable Human Systems			**12**	**12**
	Proposal Development and Data Collection			**24**	**24**
	Environmental Research Report			**24**	**24**
	Total		**120**	**72**	**192**
ELECTIVE/ OPTIONAL COMPONENT Subjects/Courses/ Modules/Units					
	Bio-Physical Environment Stream				
	Fundamentals of Soil Science			**12**	**12**
	Integrated GIS and Cartographic Applications			**12**	**12**

	Arid Lands Geomorphology			**12**	**12**
	Rangeland Ecology and Management			**12**	**12**
	Sustainable Land Management			**12**	**12**
	Hydrological Processes and Hazards			**12**	**12**
	Synoptic and Dynamic Climatology			**12**	**12**
	Environmental Quality Monitoring			**12**	**12**
	Quantitative Techniques			**12**	**12**
	Principles of Remote Sensing			**12**	**12**
	Soil Chemistry and Fertility			**12**	**12**
	Geomorphology			**12**	**12**
	Ecology of Semi-arid Savannas			**12**	**12**
	Water Resources Management			**12**	**12**

	Climate Change and Sustainable Development			**12**	**12**
	Environmental Hazards and Disease Outbreaks			**12**	**12**
	Applied Soil Science			**12**	**12**
	Applied Geomorphology			**12**	**12**
	Rangeland Management and Biodiversity Conservation			**12**	**12**
	Hydrological Analysis			**12**	**12**
	Applied Climatology			**12**	**12**
	Environmental Pollution Management			**12**	**12**
	Environmental Policy			**12**	**12**
	GIS Analysis Methods			**12**	**12**
	Environmental Systems Modelling			**12**	**12**
	Advanced Quantitative Techniques			**12**	**12**

	Soils and Irrigated Water Management			**12**	**12**
	Arid Lands Geomorphology and Management			**12**	**12**
	Wetland Ecosystem Management			**12**	**12**
	Hydrological Modelling, and Interpretation			**12**	**12**
	Advanced Instrumental Analysis for Environmentalists			**12**	**12**
	Environmental Assessment			**12**	**12**
	Total			**384**	**384**
	Human Environment Stream				
	Environmental and Geographical Paradigms			**12**	**12**
	Environment, Disease and Health Care			**12**	**12**
	Integrated GIS and Cartographic Applications			**12**	**12**

	Quantitative Techniques			**12**	**12**
	Gender and Environment			**12**	**12**
	Indigenous Knowledge Systems and the Environment			**12**	**12**
	Environment and Human Settlements			**12**	**12**
	Environment and Tourism Development			**12**	**12**
	Community Based Natural Resource Management			**12**	**12**
	Environmental Politics and Justice			**12**	**12**
	Principles of Remote Sensing			**12**	**12**
	Environmental Hazards and Disease Outbreaks			**12**	**12**
	Environmental Policy			**12**	**12**
	Natural Resources Management and Economics			**12**	**12**

	African Environment			**12**	**12**
	GIS Analysis Methods			**12**	**12**
	Environmental Systems Modelling			**12**	**12**
	Advanced Quantitative Techniques			**12**	**12**
	Rural Development Theory and Practice			**12**	**12**
	Urbanization, Industrialization and Environment			**12**	**12**
	Energy, Transport and Environment			**12**	**12**
	Ecotourism			**12**	**12**
	Environmental Assessment			**12**	**12**
	Human Populations and Spatial Analysis			**12**	**12**
	Total			**288**	**288**

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	**Credit Value**
Level [5]	**120**
Level [6]	**120**
Level [7]	**Bio-Physical Environment Stream** **240 credits (72 cores + 168 electives)** **Human Environment Stream** **240 credits (72 cores + 168 electives)**
TOTAL CREDITS	**480**

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

Fundamental Courses: 120 credits

Core Courses: 192 credits

Elective Courses: 168 credits (14 courses)

Total Credits: 480

ASSESSMENT ARRANGEMENTS

Formative (60 % for practical courses and 50 % for theory courses)

Summative (40 % for practical courses and 50 % for theory courses)

MODERATION ARRANGEMENTS

Moderation is carried out internally by registered and accredited assessors and moderators.

RECOGNITION OF PRIOR LEARNING

Recognition of Prior learning (RPL) for the award of this qualification will be in line with the Institutional and National policies

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation Transfer (CAT) for the award of this qualification will be in line with the Institutional and National policies

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

i) Horizontal Articulation (related qualifications of similar level that graduates may consider)

BSc Environmental Science (Biophysical)

BA/BSc Geography

BA Geography

BSc Geography

BA/BSc Environmental and Geographical Science

ii) Vertical Articulation (qualifications to which the holder may progress to).

MA/MSc Environmental Science

MA/MSc Geography

MA Geography

MSc Geography

MA/MSc Environmental and Geographical Science

Environmental Science or cognate degree holders articulate to cognate Postgraduate degree programs (NCQF 9). The Environmental Science or cognate degree may also serve as entry qualification to an MPhil program (NCQF 9).

iii) Employment pathways: These include:

- Environmental Conservationists
- Hydrologists
- Urban Environmental Planners
- Land use Planners
- Cartographers
- Sanitation Officers
- Wildlife Officers
- Land Administration Officers
- Agricultural Officers
- Environmental Resource Managers
- Environmental Impacts Assessors

QUALIFICATION AWARD AND CERTIFICATION

Bachelor of Science in Environmental Science shall be awarded to a candidate after fulfilling all fundamental, core, and optional courses requirements and accumulating a minimum of 480 credits and approval by Senate. The institution shall issue a certificate bearing the Qualification title as registered on the NCQF.

REGIONAL AND INTERNATIONAL COMPARABILITY

Benchmark BSc in Environmental Science, University of Oxford, UK

(https://www.geog.ox.ac.uk/study/undergraduate/course-structure.html)

This qualification at the University of Oxford in the UK offers four core courses in Year I:-

- Earth systems processes
- Human geography
- Geographical controversies
- Geographical techniques

And two core courses in Year 2 chosen from:

- Space, place, and society
- Earth system dynamics
- Environmental geography

The integrated nature of the Year 1 and Year 2 offerings in which ALL students must study both the biophysical and human environment as well as techniques (both quantitative and qualitative) is important to emphasize.

Options offered in Years 2 and Years 3 at the University of Oxford include, for example:

- African societies
- Biogeography, biodiversity, and conservation
- Climate change impacts and adaptation
- Climate change and variability
- Complexity
- Cultural spaces
- Desert landscapes and dynamics

- European integration
- Geographies of finance
- Geographies of nature
- Geopolitics in the margins
- Heritage science and conservation
- Transport and mobilities
- Dissertation
- Overseas field trip

Similarities

The proposed Bachelor of Science in Environmental Science compares well with that on offer at Oxford University, UK. This emphasizes the integrated nature of the discipline with foundational courses dominating in the physical environment, human environment and techniques in Year 1 and Year 2.

Year 3 has two compulsory integrated courses, one in each semester, namely Environmental Sustainability and Sustainable Human Systems. Students must then select from a range of increasingly specialised courses that nonetheless maintain a sustainable environment theme.

Year 4 dedicates the compulsory courses to Proposal Development and Data Collection in the first semester and the production of an Environmental Research Report in semester 2. Students then select from a range of specialised courses all of which are very applied in their focus.

Third Year options are chosen from a diverse range of courses namely Fundamentals of Soil Science, Integrated GIS and Cartographic Applications, Arid Lands Geomorphology, Rangeland Ecology and Management, Sustainable Land Management, Hydrological Processes and Hazards, Synoptic and Dynamic Climatology, Environmental Quality Monitoring, Quantitative Techniques and in semester II Principles of Remote Sensing, Soil Chemistry and Fertility, Geomorphology, Ecology of Semi-Arid Savannas, Water Resources Management, Climate Change and Sustainable Development, Environmental Hazards and Disease Outbreaks.

Fourth Year Options in semester 1 include Applied Geomorphology, Rangeland Management and Biodiversity Conservation, Hydrological Analysis, Applied Climatology, Environmental Pollution Management,

Environmental Policy, GIS Analysis Methods, Environmental Systems Modelling and Advanced Quantitative Techniques, with semester II offerings comprising Soils and Irrigated Water Management, Arid Lands Geomorphology and Management, Wetland Ecosystem Management, Hydrological Modelling and Interpretation and Advanced Instrumental Analysis for Environmentalists.

The options in Years 3 and Year 4 compare well with those offered at the University of Oxford UK.

Most qualifications include a field/practicum component that helps to ensure that courses are applied, including courses that allow students to undertake a research project of their choice.

Dissimilarities

The proposed Bachelor of Science in Environmental Science compares well with that offered by Oxford University, UK. Apart from core integrated courses in Years 1 and 2, Oxford University also offers some optional courses in Year 2, perhaps reflecting the difference between the entry level of the students in the UK system and the fact that it is a 3-year degree. Nonetheless the qualification offers a greater diversity of Specialist Courses in the final year than does Oxford.

Oxford offers a 3 year, rather than 4-year qualification as the students enter the UK qualification at a higher level.

Oxford offers an overseas field trip while the proposed qualification offers only in-country fieldwork.

Regional Qualifications

Regionally (except South Africa) degree qualifications are not offered with honours at the undergraduate level. Most Environmental Science Departments worldwide offer fundamental courses in essential background material in Years 1 and 2 – e.g., Physical and Human Environment and Quantitative.

In South Africa the University of Witwatersrand (Wits) (https://www.wits.ac.za/course-finder/undergraduate/science/environmental-studies/). Wits offers a 3-year degree qualification in BSc Environmental Studies that provides a grounding in:

- Environmental change - from land degradation to environmental management.

- Environmental policy - including global and national environmental agendas, shortfalls, and policy implementation.
- Earth systems - from climate studies and meteorology to earth surface processes, to earth's biodiversity and ecosystems.
- Human society - looking at economic development, climate and society, cultural geography, and urban dynamics.
- Geographical Information Systems and Remote Sensing – with foundation courses in GIS and Remote Sensing offered in the second and third years of study.

The qualification at Wits compares well with the developed qualification.

The University of Stellenbosch offers BSc Environmental Science via an integrated approach to the study of human-environment relations, that requires the practitioner to draw on a range of knowledge and skills associated with the natural and social sciences. The student is offered a sound theoretical and practical training in the study of environmental science.

Regional Similarities

Significantly both Wits and Stellenbosch in South Africa (https://www0.sun.ac.za/geography/programmes-courses/undergraduate/) take an integrated approach to Environmental Science that is characterized by a diverse offering of optional courses in the biophysical and human environment and is further supplemented by GIS and remote sensing courses. This is very similar to the proposed degree qualification.

All these BSc qualifications include:

- An integrated approach to studying the environment
- Consideration of contemporary environmental issues such as climate change and sustainable development
- Focus on local, regional, and global examples
- Use of a diverse array of techniques (especially geo-spatial) and modes of assessment
- Use of fieldwork and a dedicated project in the final Year.

Dissimilarities

There are No major dissimilarities.

Generally, the proposed Bachelor of Science in Environmental Science qualification compares favorably with cognate qualifications at the University of Witwatersrand and the University of Stellenbosch, South Africa, and University of Oxford (UK) against which it was benchmarked. These qualifications offer at least one, but mostly more than one, of the domains of concentration making up the proposed qualification, with the First Year Courses used as a platform upon which students can increasingly select specialist courses in the following years. Fieldwork and Project work remains common to all these BSc offerings. Significantly, the trend among strong environmental science departments against which the proposed qualification was benchmarked is towards specialization tempered with integration to equip qualifying learners with transferable skills as well as cross-cutting, holistic frameworks to effectively tackle the usually multi-dimension environment-society relationship issues (such as climate change, biodiversity degradation and sustainable development). One discernible contrast is that some qualifications use different units of credit and due to the requirement for A-levels for entry, offer 3 year, rather than 4 year (as with the proposed qualification) BSc qualifications.

REVIEW PERIOD

Every 5 years.