



FOR RECOMMENDATION

PUBLIC

OPEN SESSION

TO: Committee on Academic Policy and Programs

SPONSOR: Susan McCahan, Vice-Provost, Academic Programs
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PRESENTER: See Sponsor
CONTACT INFO:

DATE: December 6, 2019 for January 14, 2020

AGENDA ITEM: 5

ITEM IDENTIFICATION:

New Graduate Program Proposal: Master of Environment and Sustainability (MES), Faculty of Arts and Science

JURISDICTIONAL INFORMATION:

The Committee on Academic Policy and Programs has the authority to recommend to the Academic Board for approval new graduate programs and degrees. (*AP&P Terms of Reference, Section 4.4.a.ii*)

GOVERNANCE PATH:

1. Committee on Academic Policy and Programs [for recommendation] (January 14, 2020)
2. Academic Board [for approval] (January 30, 2020)
3. Executive Committee [for confirmation] (February 12, 2020)

PREVIOUS ACTION TAKEN:

The proposal for the Master of Environment and Sustainability received approval from the Faculty of Arts and Science Faculty Council on December 11, 2019.

HIGHLIGHTS:

This is a proposal for a research master's degree called Master of Environment and Sustainability (MES) to be offered by the School of the Environment in the Faculty of Arts and Science. The program is three sessions and full-time only. Students will complete 4.0 full-course equivalents (FCEs): 1.0 FCE core courses and three elective courses (1.5 FCEs) chosen from one of four

concentrations. Students will also complete a thesis (1.0 FCE). The four concentrations are: Social Sustainability; Adaptation and Resilience; The Sustainability Transition; and Global Change Science.

The degree program will provide students with a broad overview of interactions between humans and their environment and engage them in critical thinking about the nature of sustainability of human activities within the non-human world in which they are embedded. The program responds to the growing interest of students and the growing need of society to understand and develop solutions to the many environmental and human well-being challenges and opportunities facing us in the 21st century. Graduates will gain an interdisciplinary perspective on environmental issues, will learn to use methodologies and tools relevant to environmental protection and sustainability solutions, and will be well prepared for a variety of careers in the private and public sectors or for further studies at the doctoral level. A core characteristic of this program is an explicit focus on transdisciplinary approaches to graduate education. This is defined as research and teaching that (i) is problem-focussed, rather than discipline-focussed, starting from problems in the world and working back to the knowledge required to address those problems, and (ii) involves active engagement with non-academic partners in active processes of co-production of knowledge. These two characteristics mean that students will be expected to work closely with a partner from the private, public or NGO sectors, and connect scholarship and academic knowledge directly to real-world problems.

Applicants will have an appropriate honours bachelor's degree (HBA or HSc) that includes at least a minor in environment, sustainability or a closely related field, and a combination of majors and minors spanning more than one discipline, or equivalent interdisciplinary experience.

Consultation took place within the Faculty as well as with the University of Toronto Mississauga and University of Toronto Scarborough. Feedback received from these consultations has been incorporated into this proposal. As noted in Section 5 of the proposal, the directors of the Master of Sustainability Management (UTM), Master of Environmental Science (UTSC) and the School of the Environment met in the Fall of 2019 to map out the characteristics of the three programs in order to clearly define their differences. This table is in the proposal.

The program was subject to an external appraisal on October 21, 2019 by Professors Terre Satterfield, University of British Columbia and Thomas Dietz, University of Michigan. The appraisers made a number of suggestions, which have been adopted as described in the Dean's administrative response to the appraisal report.

FINANCIAL IMPLICATIONS:

The new financial obligations resulting from this program will be met at the divisional level.

RECOMMENDATION:

Be it Recommended,

THAT the proposed degree program, Master of Environment and Sustainability (MES), as described in the proposal from the Faculty of Arts and Science dated December 4, 2019 be approved effective September 1, 2021.

DOCUMENTATION PROVIDED:

- *Cover*
- *Proposal for a Master of Environment and Sustainability*



UNIVERSITY OF
TORONTO

University of Toronto New Graduate Program Proposal

The program proposal must address the purpose and content of the new program and the capacity of the unit to deliver a high-quality program.

This template is for all proposals for new graduate programs. It aligns with UTQAP requirements and will help to ensure that all evaluation criteria established by the Quality Council are addressed in bringing forward a proposal for a new program. Separate templates have been developed for other types of proposals.

Please note that all proposed new programs except graduate diplomas are subject to external appraisal.

Full name of proposed program: (i.e., Master of Arts in History; Master of Science in Sustainability Management)	Master of Environment and Sustainability
Degree name and short form: (i.e., Master of Arts, M.A.; Master of Science in Sustainability Management, M.Sc.S.M.)	Master of Environment and Sustainability, MES
Program name: i.e., History; Sustainability Management	Environment and Sustainability
Professional program: yes or no	No
Unit (if applicable) offering the program: (i.e., site of academic authority. Where a program is housed elsewhere (in physical terms), this should also be indicated.) If a new graduate unit is contemplated, please indicate here.	School of the Environment
Faculty/division:	Arts and Science
Dean's Office contact:	Dwayne Benjamin, Vice-Dean, Graduate Education
Proponent:	Prof Steve Easterbrook, Director, School of the Environment
Version date: (please change as you edit this proposal)	December 4, 2019

Development & Approval Steps	Date (e.g., of external appraisal site visit, final sign off, governance meeting, quality council submission, ministry submission)
New Program Consultation Meeting	October 24, 2018
Consultation Proponents/Dean's Office/Provost's Office	
Provost's Advisory Group	June 5, 2019
External Appraisal	October 21, 2019
Decanal signoff In signing off I confirm that I have ensured appropriate: <ul style="list-style-type: none"> ✓ compliance with the evaluation criteria listed in UTQAP section 2.3 ✓ consultation with the Office of the Vice-Provost, Academic Programs early in the process of proposal development ✓ Consultation with faculty and students, other University divisions and external institutions 	Melanie Woodin, Dean Faculty of Arts & Science October 2, 2019
Provostial signoff <i>In signing off I confirm that the new program proposal:</i> Is complete Includes information on all the evaluation criteria listed in UTQAP section 2.3	Susan McCahan, Vice-Provost, Academic Programs October 1, 2019
Unit-level approval (if required)	N/A
Faculty/divisional governance	December 11, 2019
Submission to Provost's Office	
AP&P	January 14, 2020
Academic Board	January 30, 2020
Executive Committee of Governing Council	February 12, 2020
The program may begin advertising as long as any material includes the clear statement that, "No offer of admissions will be made to the program pending final approval by the Quality Council and the Ministry of Training, Colleges and Universities (where the latter is required)."	
Ontario Quality Council	March 2020
Submitted to the Ministry (in case of a new graduate degrees and programs, new diplomas)	TBD

New Graduate Program Proposal

Master of Environment and Sustainability

School of the Environment

Arts and Science

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Instructions: Please include all sections with page numbers and a full list of appendices in the table of contents. The Table of Contents will update automatically when you right-click on it and select “Update Field” and then “Update Entire Table.”

1 Executive Summary

Please provide a brief overview of the proposed program summarizing the key points from each section of the proposal. (You may wish to complete this section last.) This may need to be used on a stand-alone basis:

We are proposing a new doctoral-stream degree, a Master of Environment and Sustainability (MES), which builds on the School of the Environment’s strong undergraduate programs and its two interdisciplinary graduate Collaborative Specializations in Environmental Studies and Environment & Health. The MES will provide students with a broad overview of interactions between humans and their environment and engage them in critical thinking about the nature of sustainability of human activities within the non-human world in which they are embedded. The program responds to the growing interest of students and the growing need of society to understand and develop solutions to the many environmental and human well-being challenges and opportunities facing us in the 21st century. The program will have a set of mandatory core courses, a choice of electives, and a research component. Graduates will gain an interdisciplinary perspective on environmental issues, will learn to use methodologies and tools relevant to environmental protection and sustainability solutions, and will be well prepared for a variety of careers in the private and public sectors, or for further studies at the doctoral level.

A core characteristic of this program is an explicit focus on transdisciplinary approaches to graduate education. While *interdisciplinary* scholarship focusses on collaboration between two or more disciplines, *transdisciplinary* approaches focus on *how* data and methods from multiple disciplines are used to create and interpret knowledge, and how to identify uncertainties, missing voices, and missing sources of knowledge. We define transdisciplinary work as research and teaching that (i) is problem-focussed, rather than discipline-focussed, starting from problems in the world and working back to the knowledge required to address those problems, and (ii) involves active engagement with non-academic partners in active processes of co-production of knowledge. These two characteristics mean that our students will be expected to work closely with a partner from the private, public or NGO sectors, and connect scholarship and academic knowledge directly to real-world problems.

The proposed program is a key part of the mandate of the School of Environment when it was established in July 2012, and it builds on the success and rapid growth of the School's undergraduate programs in Environmental Science and Environmental Studies, and its graduate level collaborative specializations¹ in Environmental Studies and Environment & Health. The School has grown rapidly in the past few years to a current complement of 10 budgetary cross-appointed tenure stream faculty, 2 administrative (non-budgetary) faculty, 1 teaching stream faculty and 2 part-time (75%) contractually limited term appointment (CLTA) research faculty, supplemented with a diverse pool of over 120 graduate faculty members from many departments across campus.

The program also responds to a broader international trend to re-focus environmental studies programs to respond to the sustainability challenges of the 21st century, and a rapidly growing suite of courses and programs offered at universities across North America and Europe. At U of T, the program brings together recent initiatives ranging from the establishment of the School, the appointment of Professor John Robinson as president's advisor on environment, climate change and sustainability, and the opportunity to use the groundswell of sustainability initiatives across the U of T campus as a living laboratory bringing together research, teaching and operational activities as case studies for sustainability in a large urban community. A key distinctive element of this program is the use of Living Laboratory projects in the program, giving students the opportunity to take an active role in campus initiatives for experiential and inquiry-based learning.

The program offers a research-based alternative to the two existing professional master's programs in this area at the University of Toronto, the Master of Environmental Science at University of Toronto Scarborough (UTSC), and the Master of Science in Sustainability Management at University of Toronto Mississauga (UTM). The three programs together will allow the university to offer a comprehensive set of programs in environment and sustainability, preparing students for a variety of future career paths. While these existing programs focus on professional roles in sustainability leadership and environmental sciences, the proposed program offers a research track, preparing students for careers such as policy

¹ An intra-university graduate field of study that provides an additional multi-disciplinary experience for students enrolled in and completing degree requirements for one of a number of approved masters and/or PhD programs.

analysis in the public sector, industrial R&D on sustainability solutions, or further research at the doctoral level.

The program is 3 terms (1 year, 4.0 full-course equivalent [FCE]), culminating in a research thesis (1.0 FCE). Admission requirements are deliberately broad, as the goal is to attract a diverse group of students from a wide variety of disciplines. Students will develop their thesis projects throughout the year, with a 0.5 FCE core course in each of the Fall and Winter terms dedicated to developing thesis topics and research skills. Students take an additional core (0.5 FCE) course in the fall term (Campus as a Living Laboratory of Sustainability), and three elective courses (1.5 FCE total) in the fall and winter terms, drawn from one of four concentrations. The four concentrations are designed to guide students in the selection of their electives in the areas of: Social Sustainability; Adaptation and Resilience; The Sustainability Transition; and Global Change Science. Electives are drawn from an extensive list of existing courses offered by graduate faculty of the School in their home departments.

We anticipate the first intake of 10-15 students in September 2020, growing to a steady state of 30 students within five years. Students will not be in the funded cohort (i.e., eligible to receive a base funding package). However, all students accepted into the program will be offered financial support drawn from Faculty of Arts and Science funds, endowed scholarships, teaching assistantships within the School, and a stipend from the thesis supervisor's research grants.

2 Effective Date & Date of First Review

Anticipated date students will start the program:

September 2021

First date degree program will undergo a UTQAP review and with which unit:²

January 2027, School of the Environment

² Programs that are inter- and multidisciplinary must identify a permanent lead administrative division and identify a commissioning officer for future cyclical program reviews.

3 Academic Rationale

Please use the headings below:

- Identify what is being proposed and provide an academic rationale for the proposed program (what is being created and why?).
- Explain the appropriateness of the program name and degree nomenclature.
- If relevant, describe the mode of delivery (including blended or online; placement, etc.) and how it is appropriate to support students in achieving the learning outcomes of the program.
- Context
 - ▶ Discuss how the program addresses the current state of the discipline or area of study. (Identify pedagogical and other issues giving rise to the creation of this program. Where appropriate, speak to changes in the area of study or student needs that may have given rise to this development.)
 - ▶ Describe the consistency of the program with the University's mission as specified within the *Statement of Institutional Purpose* and unit/divisional academic plan and priorities.
- Distinctiveness
 - ▶ Identify any unique curriculum or program innovations or creative components

What is being proposed

We are proposing a new degree, a Master of Environment and Sustainability (MES), which builds on the School of the Environment's strong undergraduate programs and its two interdisciplinary graduate Collaborative Specializations in Environmental Studies and Environment & Health. The MES will provide students with a broad overview of interactions between humans and their environment and will equip the students with the critical thinking skills needed to understand sustainability issues from multiple disciplinary perspectives by combining multiple sources of knowledge. The program will have a set of mandatory core courses, a choice of electives, and a research component.

Academic Rationale

The School of the Environment was created by the University of Toronto in July 2012 to serve as an interdisciplinary hub for education and scholarship on the environment and sustainability, creating new knowledge, training future leaders, engaging and forging partnerships with the wider community, and contributing to positive environmental and social change from the local to the global scale. The Faculty of Arts and Science Environment

and Resources Working Group Final Report (19 January 2012) recommended that stand-alone graduate programs at the Master's and PhD level be developed at the school. Such transdisciplinary graduate degrees will allow students to tailor their own mix of thematic and problem-driven courses to prepare them for a future in a fast changing field, graduating students who will be agile in response to the rapid pace of global environmental change.

At present, the School of the Environment offers two graduate-level Collaborative Specializations (CS), in Environmental Studies (ES) and in Environment & Health (E&H). Enrolment in these programs is very strong: in 2016-17 there were 161 graduate students enrolled in the Environmental Studies CS and 36 enrolled in the Environment & Health CS, for a total of 197. The combined enrolment in these two specializations has increased by a factor of 4.5 during the five years after the School of the Environment was created.

As set out in the School's mandate, the objective is now to build on the strong foundation of these existing specializations to establish new stand-alone Master's and (eventually) PhD graduate degree programs. The MES will draw upon the established research and teaching capacity of faculty now offering the Collaborative Specializations, which includes 10 budgetary cross-appointed tenure-stream faculty, 2 administrative (non-budgetary) faculty, 1 teaching-stream faculty and 2 part-time (75%) CLTA research faculty, and an extensive pool of over 120 graduate faculty members involved in School activities.

The proposed MES program will respond to the growing interest of students and the growing need of society to understand and develop solutions to the many environmental and human well-being challenges and opportunities facing us in the 21st century. Graduates will gain a transdisciplinary perspective on environmental issues, will learn to use methodologies and tools relevant to environmental protection and sustainability solutions, and will be well prepared for a variety of careers in the private and public sectors, or for further studies at the doctoral level.

Students will be given a broad theoretical understanding as well as "hands-on" engagement in research, which will provide a foundation for more specialized training in government, business, or other venues. We expect that the subject of students' thesis research will be directly related to their further work in graduate school or professional practice. Spending twelve months in intensive study of one aspect of the broader subject matter of the program will open doors to further work in either. The goal is to have students graduate with knowledge of environmental issues and solutions, as well as an understanding of how to implement those solutions.

Program name and degree nomenclature

The program will have two broad but linked themes specified in the degree name, “Master of Environment and Sustainability”. These fall within the subject matter addressed by the established body of transdisciplinary knowledge in environmental studies, environmental sciences, and sustainability. That subject matter is usually conceptualized as being the two-way human-nonhuman relationship. This relationship arises from the fact that human activity is now on a scale to fundamentally affect Earth systems, which in turn adversely affects human systems. Accordingly, transdisciplinary study is focussed upon two basic questions:

1. How is human activity contributing to global environmental change and what are the impacts upon the Earth system?
2. How can those impacts be reduced while at the same time achieving other human goals such as human well-being and economic prosperity?

The underlying theme is the simultaneous need to improve both human and environmental well-being, with recognition of the multiple linkages between them.

The “Environment” part of the proposed program is related to the first question and has three components. The first is understanding the causes of human-induced global environmental change and the nature of the resulting impacts on the Earth's environment. The second is understanding the implications of those impacts, both for the nonhuman world, through such things as species extinctions, and for the human world, by means of the boomerang effect of those impacts. The third involves a critical analysis of solutions – the “science” of solutions, including the ethical implications as humanity moves to include the nonhuman within the moral community.

The “Sustainability” part of the proposed program is related to the second question and has two primary components. The first is examination of the nature of a human world embedded in a sustainable relationship with the nonhuman, for example, by means of a steady-state stock and flow of materials and energy. The second is examination of the necessary technological, legal, economic, governance and societal changes required to achieve a sustainable human-nonhuman world.

Context

The time is right for the University of Toronto to capitalize on its resources and research strengths and to expand its existing graduate degree offerings by mounting a stand-alone Master of Environment and Sustainability. This development would be in keeping with larger

trends in leading academic institutions across North America. The rapidity with which studies in environment and sustainability are being institutionalized at universities in the United States, Canada, and Europe is indicative not only of the salience of environmental issues and concerns among institutions of higher learning, but also of how these areas are maturing as disciplines in their own right.

The proposed MES is relevant now at the University of Toronto for two reasons, one related to events off-campus and the other to the current evolution of programs at the University. Off-campus, a transdisciplinary program such as this is needed now because the societal problems it will help address are growing, not shrinking. There exists a significant opportunity for the post-secondary sector to become a kind of societal test-bed for sustainability, treating the whole campus as a living laboratory where we can implement, test, research and teach sustainability, in so contribute directly to the significant changes required to reach a sustainable future. In so doing, universities will be able to be at the forefront of the sustainability transition; implement operational sustainability at a neighbourhood scale of great interest to cities around the world; do research on the technical, economic, social and institutional challenges involved in achieving sustainability; develop and test technological and organizational innovation for sustainability; train students in sustainability skills they can use in their career; and work with private, public and NGO sector partners to take this learning out into the world.

It is the right place on the University of Toronto campus because of recent events: the establishment of the School of the Environment, additions to its cross-appointed faculty, and the strength of its graduate Collaborative Specializations all provide key educational components of this initiative. The initiative will also build on and complement the existing professional master's programs in environment and sustainability at the Scarborough and Mississauga campuses. The MES also aligns well with the initiatives identified in "*Beyond Divestment: Taking Decisive Action on Climate Change*", President Gertler's Administrative Response to the Report of the President's Advisory Committee on Divestment from Fossil-Fuels (<http://www.president.utoronto.ca/beyond-divestment-taking-decisive-action-on-climate-change>, March 2016).

Some fifty years after it first emerged, transdisciplinary environmental studies is now an established, recognized body of thought and practice, as are the various disciplines on which it builds, with their much longer histories. The fact that our proposed program is similar to the growing number of graduate programs at peer institutions across North America, that are focused on the environment and sustainability, listed in Appendix E, attests to the coming of

age of our subject matter. It is clearly advantageous and even critical for the University of Toronto to initiate such a program at this time, otherwise it risks being left behind.

This program is consistent with the University's mission described in the Statement of Institutional Purpose, which is "The University of Toronto is committed to being an internationally significant research university, with undergraduate, graduate and professional programs of excellent quality." The MES will build on the internationally recognised research of the School's existing faculty, and will help develop further research strength at the graduate level, improving the University's global standing in societally-relevant research. The University's new Strategic Research Plan (2018-23) acknowledges that "*Understanding the dynamics of both natural and human-made changes in the environment requires fundamental knowledge spanning many disciplines.*" [13]. All seven themes in this Strategic Plan touch on issues related to the environment and sustainability in some way:

- DISCOVER: Our Understanding of Humanity and the Universe
- SUSTAIN: Societies, the Environment, and Natural Resources
- PROMOTE: Healthy People, Healthy Communities, and a Healthy World
- ENGAGE: Language, Culture, Art, and Values
- ADVANCE: Governance, Diversity, and Social Justice
- INNOVATE: Technologies for the Future
- BUILD: Community and Livable Societies

The Strategic Plan reflects the University's priorities and provides a framework for building research programs, linking research and education, and leveraging partnerships in the areas of environment and sustainability. The Master of Environment and Sustainability is directly relevant to several objectives articulated in the Strategic Plan, as it will contribute to (i) providing leadership in research and innovation related to the environment and sustainability; (ii) fostering collaborations, partnerships, and engagement within U of T and beyond; (iii) support integration of research and innovation in the graduate student experience; and creating a culture of scholarship that values interaction, collaboration, and community.

Distinctiveness

The social contract between the university sector and society at large is shifting. Increasingly universities are being called upon to contribute directly to the big challenges faced by the societies in which they exist and which support them financially. One such challenge, which offers very large opportunities for universities to respond to this call, is sustainability.

Sustainability is a broad term, encompassing both environmental and human well-being. It addresses the question of how to sustain human and societal well-being in the face of massive environmental change.

In support of this, universities can work with partners from the private, public and non-governmental organization (NGO) sectors to investigate the technical, economic and behavioural aspects of integrated sustainability solutions at the urban neighbourhood scale. This means that the entire campus is an experiment in sustainability, a community in which staff, students and faculty can test, teach, learn, apply and share the outcomes of their inquiries. Living lab projects—campus initiatives that combine operational needs, partnerships, research, and education components—are tangible manifestations of this idea.

The MES will thus incorporate living laboratory projects into the program, giving students the opportunity to take an active role in campus initiatives that combine operational needs, partnerships, research, and education, applying and testing sustainability policies, technologies and practices addressed in their courses. Students will have three options for engagement with the living laboratory concept: (i) course work that includes living lab opportunities; (ii) partnership projects; and (iii) a living lab approach in the thesis project.

4 Fields/Concentrations

- Description of fields/concentrations, if any. (Please note: graduate programs are not required to have fields/concentrations in order to highlight an area of strength or specialization within a program.)

The proposed program will be broad in scope but will provide a choice of four concentrations as a framework for selecting courses and defining the research topic. All students enrolled in the MES will choose one of these four areas of concentration, and will take three electives associated with the concentration.

Concentration 1: Social Sustainability

This concentration addresses issues of equity, diversity, social cohesion, quality of life, behavioural sustainability, and democracy and governance as related to the human-nature relationship. It also encompasses the social components that allow for change or that prevent change towards sustainable solutions. Notwithstanding the importance of public

policy and market activity, societal attitudes toward nature, organizations, and social movements play an essential role in determining this relationship. Environmental worldviews – the assumptions, values, norms and paradigms used to understand the human relationship with nature – have enormous influence largely because they are unexamined and taken for granted. In Canada, indigenous perspectives on the environment are receiving increasing attention. Environmental problems such as climate change, water pollution, resource depletion and others have a strong moral component both in terms of the nonhuman species affected and the equity of their differing impacts upon humans now and in the future. At the same time, environmental policy to address these problems has differing degrees of fairness. These moral issues are important in their own right and also significantly affect the likelihood of action and acceptability of possible solutions.

Concentration 2: Adaptation and Resilience

As the world faces an era of environmental change, particularly in the area of climate, the question of how humanity can anticipate and respond in a sustainable manner is receiving increasing attention. Adaptation involves the adjustment of natural or human systems to change, to reduce harmful impacts or to take advantage of beneficial opportunities. In contrast, resilience describes the ability of such systems to absorb change, maintain their function, and evolve in ways that improve their future sustainability. The two concepts are related, in that adaptability is the ability of humans to influence the state of resilience. Adaptation is a necessary response to climate change, in parallel to global efforts to reduce greenhouse gas emissions. The frequency and intensity of extreme events, such as urban flooding, drought, and wildfires, is increasing, while gradual changes, such as permafrost degradation, sea level rise, shrinking Arctic sea ice, and plant species migration are also happening. At the urban scale, the impacts of climate change and extreme weather events on existing energy, water, and transportation infrastructure have implications for public safety, public health, food security, and emergency management. In the wider Canadian context, adaptation and resilience are important in many sectors, including natural resources (forestry, energy and mining), food production, industry, biodiversity and protected areas, human health, water and transportation infrastructure.

Concentration 3: The Sustainability Transition

Since the Industrial Revolution, the world has put in place a system of infrastructure, production, markets, public policy, values and culture based on fossil-fuel energy. Today, we are tentatively beginning to make changes in all those areas, starting the transition to a low-

carbon economy and a sustainable society. This is a social revolution equivalent to the European transition from feudalism to capitalism. The transition poses challenges and opportunities in our scientific understanding of the impacts driving the transition; the role of the ICT (information & communication technology) revolution; energy-system technologies; core economic concepts related to environmental and resource sustainability; societal perceptions, values and norms; and issues of governance and politics, lifestyle, human settlement, livelihood, culture, economic activity, and trade. Because these challenges constitute an interconnected system spanning civil society, state and market, a transdisciplinary perspective is essential. This concentration will give graduates that necessary perspective, allowing them to proceed to further study or professional practice.

Concentration 4: Global Change Science

Human-induced global environmental change has emerged as one of this millennium's defining scientific and societal challenges. The scientific problem of global environmental change requires an understanding of the different components of the Earth's environment, from the atmosphere to the ocean to the biosphere, and of the many ways they interact. Because of this, global change science is an intensively transdisciplinary research endeavour. For example, the full impact of rising concentrations of greenhouse gases in the atmosphere depends on a complex set of feedback effects, including changes in ocean chemistry, ocean circulation patterns, biological processes in plants and soils, atmospheric convection and cloud formation, and geological processes such as rock weathering. Expertise in each of these processes is distributed across several disciplinary departments at U of T. A Centre for Global Change Science (CGCS, www.cgcs.utoronto.ca) was established at U of T in September 2005 to draw together this expertise, provide a focus for research on the global-scale effects of human society on the Earth's climate and environment, and coordinate undergraduate and graduate education programs in this area. However, the centre does not offer its own degree programs and it will support this new degree program. Including this concentration in the MES will provide a formal transdisciplinary degree option to complement existing discipline-based programs, and has been developed in consultation with the CGCS and its partners (the Departments of Chemical Engineering and Applied Chemistry, Chemistry, Ecology and Evolutionary Biology, Geography, Earth Sciences, Physics, Chemical and Physical Sciences at UTM, Physical and Environmental Sciences at UTSC, and the Faculty of Forestry).

5 Need and Demand

- Provide a brief description of the need and demand for the proposed program focusing, as appropriate, on student interest, societal need, employment opportunities for prospective graduates, interest expressed by potential employers, professional associations, government agencies or policy bodies and how this has been determined.
- How is the program distinct from other programs at U of T? (Address, if relevant, how this program might affect enrolment in other related programs offered here.)
- With specific reference to the impact on need and demand, describe how the proposed program relates to (is similar to or different from) existing programs offered by other universities in North America and Internationally (with specific reference to Canadian and Ontario examples). In doing this you may wish to append a table showing other programs.

Need and Demand

The MES is building on a wide variety of undergraduate programs offered by the School of the Environment. These include core programs in Environmental Science (BSc Major and Minor) and Environment Studies (BA Major and Minor) that provide our undergraduate students with broad interdisciplinary perspectives. The School also collaborates with other disciplines to offer the following programs:

- Specialist and Major in Environment & Health
- Specialist in Environment & Toxicology
- Specialist in Environmental Chemistry
- Specialist in Environmental Geosciences
- Major and Minor in Environmental Ethics
- Minor in Environment & Energy
- Minor in Environment & Behaviour.

These programs combine the School's interdisciplinary core with a deliberately focused set of discipline-specific courses. Students can also choose from seven other directed Minors offered by other departments (Environmental Anthropology, Environmental Biology, Environmental Chemistry, Environmental Economics, Environmental Geography, Geographic Information Systems, and Physical & Environmental Geography). MES students will have the opportunity to work as teaching assistants in the School's undergraduate courses, which typically require about 4200 teaching assistant (TA) hours. Currently, our TAs come from many departments; having our own MES students as TAs will strengthen our undergraduate programs by drawing upon graduate students who have an explicit transdisciplinary focus to their studies, and a solid grounding in key issues in environment and sustainability.

Student Demand

Our own students provide an indication of potential demand for the MES from undergraduate students studying elsewhere. Our students tend to be passionate about the environment and keen to engage in programs that will enable them to make a difference in the world. In a 2016 survey of students enrolled in School of the Environment programs that included a question about why they had chosen their program, the largest number of respondents (40%) indicated they did so because they were motivated by care for, or concern about, the environment. Among the other responses, participants indicated interest in pursuing an environmental career, taking a specific program, and engaging in transdisciplinary studies.

Well over 2000 students have graduated with majors, minors, or specialists in environmental programs affiliated with the School and its predecessor units since 2005, with majors and specialists increasing from 38 graduates in 2005 to 130 in 2015-16. There have been similar increases in the Major in Environmental Studies, with 3 graduates in 2010-11 increasing to 97 in 2015-16. In Fall 2017, 778 undergraduates were

enrolled in the School's core and collaboratively offered programs, and ~3000 students (~1500 FCE) were enrolled in our courses. Table 1 summarizes annual enrolment in the School's undergraduate programs over the past eight years.

Table 1: Enrolment, School of the Environment undergraduate programs, 2011-2018

School Program Enrolments	Nov 2011	Nov 2012	Nov 2013	Nov 2014	Nov 2015	Nov 2016	Nov 2017	Nov 2018
Core Programs								
Environmental Studies BA Major	315	395	413	386	334	335	321	289
Environmental Studies BA Minor	115	129	147	133	141	156	164	143
Environmental Science BSc Major (new 2013-14)	n/a	n/a	16	32	40	53	56	78
Environmental Science BSc Minor (new 2014-15)	n/a	n/a	n/a	7	16	23	15	14
Total Core Programs Enrolment	430	524	576	558	531	567	556	524
Environmental Chemistry Specialist*	10	10	10	6	5	9	9	8
Environment and Health BSc Specialist	17	22	17	15	14	15	11	8
Environment and Health BSc Major	71	61	54	50	60	72	67	70
Environmental Geosciences Specialist*	3	8	11	8	11	7	6	7
Environment & Toxicology Specialist	5	9	3	5	3	6	6	10
Environmental Ethics BA Major	39	38	43	44	48	48	44	36
Environmental Ethics BA Minor	56	54	48	27	33	42	50	58
Environment & Energy BSc Minor	23	30	28	33	33	24	26	26
Environment & Behaviour BSc Minor	11	17	16	15	20	23	21	14
Total Collaborative Programs Enrolment	235	249	230	203	227	246	240	237
Total All Program Enrolments	665	773	806	761	758	813	796	761

University of Toronto undergraduates pursuing environment-related major and specialist degrees frequently express interest in pursuing interdisciplinary graduate degrees related to the environment and sustainability. While the School's graduate Collaborative Specializations offer excellent opportunities for research and training in this area, they do not substitute for a direct-entry degree program. The consensus among the School's faculty and its collaborating partners is that the time is indeed ripe for the University of Toronto to expand its existing graduate offerings to attract a new cohort of students interested in pursuing an interdisciplinary environmental graduate degree.

The success of several programs, including the Master of Environmental Science at UTSC and the Master of Science in Sustainability Management at UTM, provides additional evidence of growing demand for Master's-level degrees in environment and sustainability at the University of Toronto. As interest in environmental issues and sustainability solutions increases, the School's Collaborative Specializations have experienced sustained growth over the last decade. Based on discussions with our current graduate students, we expect a number of potential Collaborative Specialization students will select the new MES once it is established. Enrolment in the Environmental Studies Collaborative Specialization has been steady and substantial, with annual enrolments (new and continuing students) increasing from 8 in 2005-06 in the former Centre for Environment, to 41 in 2012-13 (the year the School was established), to 161 in 2016-17. Enrolment in the Environment & Health Collaborative Specialization is smaller, but has also increased

notably in the recent years, up from 3 in 2012-13 to 36 in 2016-17. The combined enrolment in both Collaborative Specializations thus increased by a factor of 4.5 (from 44 to 197) in the five years after the School was established; this provides clear proof of graduate student interest in this area.

Societal Need & Employment Opportunities

The MES program is aimed at students and professionals who want to pursue a variety of careers in the private and public sectors, or further studies at the doctoral level. Graduating students will have the intangible but essential skills of critical thinking, transdisciplinary thought and communication, environmental research and tools, and the ability to combine precise, accurate detail with big-picture perspective. The Living Lab approach will also provide them with practical, work-ready skills.

Successful resolution of any given environmental problem requires governments, business firms, and all others involved to address its many components, ranging from the scientific to the ethical. Organizations have a need for university graduates who have both specialized disciplinary expertise and also experience communicating with, and working with, specialists in other fields. There is also a growing employment sector in this area as the importance of sustainability is increasingly recognized across many industrial sectors. A recent report by ECO Canada (Environmental Job Market Trends in Canada 2014-2017, <https://www.eco.ca/research/report/environmental-job-market-trends-2014-2017/>) found 22,700 environmental job postings in 2017 – a 9% annual increase, against a decrease of 2% for the economy as a whole. Nearly 7,000 of these jobs were in the Environmental Sustainability sector, which includes jobs in Education & Training, Research & Development, Policy & Legislation, and Communications & Public Awareness.

The MES will contribute to meeting these needs by giving students precisely the types of transdisciplinary, environmental skills governments, business, and others require today. Example career paths include (1) policy analysis in government agencies such as Natural Resources Canada (NRCan) and Environment & Climate Change Canada (ECCC); (2) Research and development in companies developing sustainability products and solutions; and (3) teaching and research careers in the academic sector after further study at the doctoral level.

Distinction from other U of T programs

The content of the MES and its transdisciplinary nature make it a distinctive program at the University of Toronto. It is intended for students who wish to pursue a broad transdisciplinary research degree that explores issues related to the environment and sustainability through the multiple perspectives of the social sciences, humanities, and natural sciences, drawing on the breadth of expertise in the School's faculty.

The MES differs from the Master of Science in Sustainability Management (MScSM) offered by the Institute for Management & Innovation at UTM. The MScSM is a course-based professional master's degree comprising 16 courses, a major research paper and an internship. The program, taken over 20 months, provides training in science and managerial skills and is intended for students looking for careers focussed on sustainability-related management, whereas the MES focusses on research skills, preparing students for further academic study or research related careers.

The MES also differs from the Master of Environmental Science at UTSC, which is a one-year professional master's science degree. The MEnvSc includes a policy lens, but is primarily intended to train practitioners for careers in the areas of environmental monitoring, assessment, remediation and restoration; conservation; and climate change impact assessment. While the MES will include science elements, it will connect these explicitly with policy, social science and humanities issues related to environment and sustainability.

The major area of overlap between the MES program and the MEnvSc at UTSC lies in the MES concentration on Adaptation and Resilience and the UTSC field Climate Change Impact Assessment, which includes a focus on adaptation. While there is indeed overlap of subject-area here, the MES concentration takes place within a different program context, and points to a different career trajectory, than the UTSC field.

Table 2 summarizes the difference between these programs, and will form the basis for a coordinated marketing of the three programs to prospective students. This table was developed jointly by the director of the School of the Environment, the home of the proposed MES program, and the directors of the MScSM and MEnvSc programs.

Table 2: Comparison with existing Master's Programs at the University of Toronto

	Appeals to Students with:	Program Structure	Key Themes:	Commonalities	Career Trajectories:
MScSM Sustainability Management (Mississauga Campus)	<ul style="list-style-type: none"> • Background in management science, engineering, or natural/social sciences; • Interest in combining science and management perspectives 	Professional program <ul style="list-style-type: none"> • 20-month program; • 10-16 week internship • Capstone project • Year-long research paper course 	<ul style="list-style-type: none"> • Integration of business management, natural sciences, and social sciences; • Environmental, economic, and social sustainability; • Management principles and strategies; • Environmental Law and Policy. 	<p>Inter-disciplinary approaches;</p> <p>Integrated thinking for 21st Century sustainability challenges</p> <p>Putting knowledge into action</p> <p>Critical thinking and communication skills</p>	Leadership and senior management roles in sustainability in private and public sector.
MEnvSc Environmental Science (Scarborough Campus)	<ul style="list-style-type: none"> • Background in the natural sciences; • Interest in the science of environmental monitoring and assessment 	Professional program <ul style="list-style-type: none"> • 12-month program; • 16-week internship; • Research paper option 	<ul style="list-style-type: none"> • Understanding and applying scientific methodologies; • How to collect and organize original data; • Research ethics; • Science communication. 		Professional environmental scientist in government, consulting, or private industry.
MES Environment and Sustainability (St George Campus)	<ul style="list-style-type: none"> • Any background; • Interest in problem-centred research on global environmental challenges 	Research-based program <ul style="list-style-type: none"> • 12-month program • Living Laboratory Experience • Ongoing thesis project throughout 	<ul style="list-style-type: none"> • Integration of perspectives from humanities, social sciences, and natural sciences; • Trans-disciplinary approach combining multiple sources of knowledge; • University campus as a living laboratory for sustainability. 		Research career in academia, government, or private sector.

A number of discipline-based Master's degrees across U of T touch on some of the topics covered in the MES. Most notably, these include:

- Master of Science in Ecology and Evolutionary Biology, which focusses on biological systems, addressing sustainability issues in its coverage of ecosystems and conservation;
- Master of Science and Master of Arts in Geography, which both offer a broad set of sub-fields: physical geography (including climate change and environmental chemistry); environmental geography and resource management; urban/economic geography (including planning and policy); Historical/Social/Cultural Geography; and Spatial information systems.
- Master of Science in Planning (MScPI), which is a two-year professional master's program which prepares students for careers in planning in public or private sectors, and includes a concentration on Environmental Planning.

These programs differ from the MES in that they all begin with a solid grounding in the methods and perspectives of their respective disciplines, and then apply them to questions that often involve environmental or sustainability issues. The MES reverses this approach: the challenges of environment and sustainability come first, and students are motivated to combine knowledge and methods from multiple disciplines to bear on them.

Programs at other Universities

Appendix E summarizes a selection of Master's programs similar to that proposed. A total of 28 programs were examined, three at the University of Toronto, nine in Ontario, four others in Canada, and twelve in the USA and Europe. A review of these programs confirms the fact that "environment" and "sustainability" as subjects of university teaching and research are transdisciplinary and comprehensive, spanning pretty well all fields of academic inquiry and applied practice. Europe has many programs in sustainability science, unlike Canada, which lags behind in this area. These tend to be more integrated than environmental science, including both climate science and sustainable society, bringing in social issues to a science program, but perhaps less emphasis on the human aspects. This review shows that university programs address different aspects of that subject matter, presumably based on availability of expertise.

Focussing on the other programs in Ontario, some are professional programs with an emphasis on training for jobs/careers, and a few offer co-op placements. Many offer the option of either a thesis or a research paper, with the former taking longer. They vary in length between one and two years.

The MES program proposed here is distinguished in two ways from most of the other Canadian programs. First is its ability to draw on the research power of the University of Toronto across a wide range of disciplines to support its transdisciplinary nature. The University has more than 120 faculty members

working in the areas of Environment and Sustainability and is internationally recognized for its research strength related to the environment, ranked 23rd in the world in Environment/Ecology by National Taiwan University, 34th in Environment and Ecology by US News and World Report, and 37th in Environmental Science by QS World University Rankings. No other university in Canada can offer students the breadth and depth of environment-related scholarship found at the University of Toronto. We expect that the program will be of significant interest to Canadian students wishing to pursue a Master's degree in the environment and sustainability fields.

The second distinguishing feature is the specific focus of the MES program on transdisciplinarity research based on working with non-academic partners. A tangible expression of this is that the MES will incorporate living laboratory projects into the program, giving students the opportunity to take an active role in campus initiatives that combine operational needs, partnerships, research, and education, applying and testing sustainability policies, technologies and practices addressed in their courses. Students will have three options for engagement with the living laboratory concept: (i) course work that includes living lab opportunities; (ii) partnership projects; and (iii) a living lab approach in the thesis project.

6 Enrolment

- Please provide details regarding the anticipated in-take by year, reflecting the expected increases to reach steady state. Include approximate domestic/international mix. This table should reflect normal estimated program length. (Please adjust the table as necessary.)
- Please provide an explanation of the numbers shown and their relation to the Faculty/division's enrolment plan. Please be specific where this may differ from approved enrolment plans.

We expect an initial year intake of 10-15 students, ramping up to a steady-state intake of 30 students in five years.

Anticipated student enrolment is 86% domestic and 14% international. This estimate is based on enrolments in the Environmental Studies and Environment & Health Collaborative Specializations, for which 14% (35 of 253) of new admissions between 2011 and 2016 were international graduate students.

These enrolment numbers will be within the Faculty's research-stream master's enrolment targets.

Table 3: Graduate Enrolment Projections

Year of Study	2020-1	2021-2	2022-3	2023-4	2024-5 (steady state)	2025-6	2026-7
Year 1	10-15	15	20	25	30	30	30
Total	10-15	15	20	25	30	30	30

7 Admission Requirements

- Provide a formal statement of admissions requirements as they will appear in the SGS Calendar entry.
- Explain how the program's admission requirements are appropriate for the learning outcomes established for completion of the program.
 - ▶ How will they help to ensure students are successful?
 - ▶ Provide sufficient explanation of any admissions requirements that are above or in addition to the normal minimum requirements for a graduate program at this level (including higher GPA, specific knowledge or skills – e.g., prior calculus; prior professional practice; additional language, interviews, portfolio, letters of intent, etc.) For example, are there specific undergraduate or master's programs from which students may be drawn?

Minimum Admission Requirements:

Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the School of the Environment's additional admission requirements stated below:

- An appropriate honours bachelor's degree (HBA or HBA) that includes at least a minor in environment, sustainability, or a closely related field, from a recognized university with a minimum standing equivalent to at least a University of Toronto B+ in each of the final two years of study.
- Applicants should have completed a combination of majors and minors spanning more than one discipline, or have equivalent interdisciplinary experience.
- A letter of intent.

- Two (2) letters of reference.

Explanation

The program aims to attract students with a broad range of backgrounds, in any area of natural sciences, social sciences, humanities, or related fields such as architecture, forestry, or engineering. It is expected that the program will specifically appeal to students who have already taken an undergraduate degree with an environment/sustainability concentration but is also designed for students with a broad range of different disciplinary backgrounds from recognized Canadian or international universities. The letter of intent and references will be used to evaluate relevant interest and experience for students who have not taken environment/sustainability programs.

8 Program Requirements, Learning Outcomes, Degree-Level Expectations (DLEs), and Program Structure

- In a curriculum map, or in the table below, or in another format appropriate for the discipline, state the program learning outcomes and program requirements, and show how the program learning outcomes are appropriate for the degree level expectations.
- Discuss how the design, structure, requirements and delivery of the program are appropriate for the program learning outcomes and degree-level expectations. Please include:
 - ▶ The sequencing of required courses or other learning activities, etc.
 - ▶ The mode of delivery of the program (face-to-face; blended or online; placement, etc.) and how it is appropriate to support students in achieving the learning outcomes of the program and the degree-level expectations. Whether the program will be offered on a full-time basis only or will also be offered part-time and if so, why.
 - ▶ The program length for both full-time and part-time students. Address how the program requirements can reasonably be completed within the proposed time period.
 - ▶ Describe how the specific elements of the curriculum (e.g., Internships, etc.) will be administered.

- ▶ A clear indication of how faculty “scholarship and research is brought to bear on the achievement of Degree Level Expectations” (UTQAP 1.1)
 - ▶ For research-focused graduate programs, provide a clear indication of the nature and suitability of the major research requirements for degree completion. For professional graduate programs, how the research expectations of the degree level expectations will be met.
 - ▶ Describe how the program structure and delivery methods reflect universal design principles and/or how the potential need to provide mental or physical health accommodations has been considered in the development of this program.
- Please include the standard text which has been inserted in the box.

The Master of Environment and Sustainability (MES) is a full-time 3-term program (1 year, 4.0 FCE). No part-time option will be offered.

The Program Learning Objectives (PLOs) are as follows. By the end of the program, students should be able to:

PLO 1: Demonstrate how multiple data sources and research methodologies from multiple disciplines—in the social sciences, natural sciences, and humanities—are used to create and interpret knowledge in environment and sustainability;

PLO 2: Critically evaluate the body of transdisciplinary research relevant to specific problem(s) and solution(s) in environment and sustainability;

PLO 3: Analyze stocks and flows of material and energy to assess the sustainability of human activities in relationship to the non-human world in which they are embedded;

PLO 4: Identify the technical, legal, economic, governance and social changes required to achieve sustainability in both local and global contexts;

PLO 5: Compare strategies and develop solutions to sustainability challenges by applying methodologies and tools from multiple disciplines and drawing on multiple lines of evidence;

PLO 6: Communicate with clarity and accuracy using a variety of narrative structures to explain an issue and to build support for a proposed course of action among a broad cross-section of stakeholders;

PLO 7: Critically assess the success of specific sustainability solutions over multiple timescales and from multiple perspectives, including the social, economic, and environmental impacts of different strategies.

PLO 8: Critique the choices of problem framing and system boundaries in descriptions of environment and sustainability issues to identify uncertainties, missing voices, and missing sources of knowledge.

PLO 9: Take responsibility for their own role as an advocate for sustainability in the organizations and communities they find themselves in, within the context of prevailing norms, value systems and ethical principles.

To ensure students meet these PLOs, the MES is structured around three core courses, three elective courses and a mandatory individual thesis. During the core courses, students begin work on their thesis research projects. All core courses are delivered face-to-face, with classroom seminars designed to build a cohort and encourage peer-learning. The set of available elective courses is broad in scope, but the MES provides a choice of four concentrations as a framework for selecting courses and defining the research topic. The electives will initially be drawn from a list of existing courses (see Appendix A), with further electives to be added as demand grows.

Each student will be assigned an initial research supervisor on admission to the program, who will guide students in selecting a thesis topic, and advisory committee, which must be approved by the end of the fall term. Students will begin work on their thesis projects during the fall and winter research courses (ENV1197H and ENV1198H). In the fall term, each student will complete a 5-10 page research proposal, including a description of the research topic, a literature review, and a discussion of the proposed methodology. The research proposal and choice of concentration should be approved by the student's advisory committee by the end of the Fall term. Students will complete their theses during the summer session thesis course (ENV1199Y). The thesis will demonstrate the student's mastery of many of the program level objectives. It must include a literature review (PLO1, PLO2), analysis of a specific issue (PLO3, PLO4) and will identify solutions (PLO5) and evaluate them (PLO7, PLO8). The thesis is should be no longer than 15,000 words, and be completed by the end of August.

Table 4: Timeline and courses for the MES.

Term	FCE	Course Number and Title
Fall term	0.5	ENV1103H The U of T Campus as a Living Lab of Sustainability (<i>this is an existing course that will become a mandatory core course for the MES</i>)
	0.5	ENV1197H Research in Environment and Sustainability, Part 1. (<i>this is a new mandatory core course developed specifically for the MES. It will bring students together for shared seminars on transdisciplinary research skills, as well as working independently with their faculty supervisors</i>).
	0.5	Elective course #1
Spring term	0.5	ENV1198H Research in Environment and Sustainability, Part 2 (<i>this is a new mandatory core course developed specifically for the MES. It will bring students together for shared seminars examining recent research projects undertaken by research faculty, as well as independent research with faculty supervisors</i>).

	0.5	Elective course #2
	0.5	Elective course #3
Summer term	1.0	ENV1199Y Thesis (<i>mandatory</i>)

Whereas the Province’s Quality Assurance Framework requires that students complete a minimum of two-thirds of courses at the graduate level, the University of Toronto requires graduate students to complete all of their course requirements from amongst graduate level courses. This proposed program complies with this requirement.

Table 5: Master's DLEs, Program Learning Outcomes & Requirements

Master’s DLEs (based on the Ontario Council of Academic Vice-Presidents [OCAV])	Master’s Program Learning Objectives and Outcomes	How the Program Design/Structure of the required courses and other learning activities supports the achievement of Program Learning Outcomes
Expectations: This Master of Environment and Sustainability is awarded to students who have demonstrated:		
<p>1. Depth and Breadth of Knowledge A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the academic discipline, field of study or area of professional practice.</p>	<p>To demonstrate Depth and Breadth of Knowledge, MES graduates should be able to: PLO 1: Understand how multiple data sources and research methodologies from multiple disciplines—in the social sciences, natural sciences, and humanities—are used to create and interpret knowledge in environment and sustainability; PLO 2: Critically evaluate the body of transdisciplinary research relevant to specific problem(s) and solution(s) in environment and sustainability; PLO 4: Understand the technical, legal, economic, governance and social changes required to</p>	<p>The MES Program will develop students’ depth and breadth of knowledge in three ways: The thesis project, which runs throughout the program, guided by a faculty supervisor and advisory committee. Students will select their thesis topic and develop their knowledge of this topic in the core research courses, ENV1197 & ENV1198, and will demonstrate mastery in the defense of a thesis by the end of the program. The Living Lab core course (ENV1103), which all students will take in the first term, will explore core knowledge in environment and sustainability using a problem-centred approach.</p>

Master’s DLEs (based on the Ontario Council of Academic Vice-Presidents [OCAV])	Master’s Program Learning Objectives and Outcomes	How the Program Design/Structure of the required courses and other learning activities supports the achievement of Program Learning Outcomes
Expectations: This Master of Environment and Sustainability is awarded to students who have demonstrated:		
	achieve sustainability in both local and global contexts;	The elective courses, grouped into four specializations, will allow students to build their breadth of knowledge in relation to a significant challenge area for environment and sustainability.
<p>2. Research and Scholarship A conceptual understanding and methodological competence that</p> <p>Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;</p> <p>Enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence; and</p> <p>Enables a treatment of complex issues and judgments based on established principles and techniques; and, on the basis of that competence, has shown at least one of the following:</p> <ul style="list-style-type: none"> ▶ The development and support of a sustained argument in written form; or ▶ Originality in the application of knowledge. 	<p>To demonstrate Research and Scholarship, MES graduates should be able to:</p> <p>PLO 1: Understand how multiple data sources and research methodologies from multiple disciplines—in the social sciences, natural sciences, and humanities—are used to create and interpret knowledge in environment and sustainability;</p> <p>PLO 2: Critically evaluate the body of transdisciplinary research relevant to specific problem(s) and solution(s) in environment and sustainability;</p> <p>PLO 3: Analyze stocks and flows of material and energy to assess the sustainability of human activities in relationship to the non-human world in which they are embedded;</p>	<p>The MES will develop students’ research and scholarship skills primarily through the core research courses ENV1197 & ENV1198. These courses will give the students a grounding in transdisciplinary research methods, and will include case studies of research projects conducted by our research faculty. Students will complete a thorough literature review, produce a well-written research proposal, and make presentations to the thesis advisory committee, and receive feedback from the advisory committee on progress. At the end of the program, they will present their thesis and defend it orally.</p>

Master’s DLEs (based on the Ontario Council of Academic Vice-Presidents [OCAV])	Master’s Program Learning Objectives and Outcomes	How the Program Design/Structure of the required courses and other learning activities supports the achievement of Program Learning Outcomes
Expectations: This Master of Environment and Sustainability is awarded to students who have demonstrated:		
<p>3. Application of Knowledge Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.</p>	<p>To demonstrate Application of Knowledge, MES graduates should be able to: PLO 3: Analyze stocks and flows of material and energy to assess the sustainability of human activities in relationship to the non-human world in which they are embedded; PLO 5: Compare strategies and develop solutions to sustainability challenges by applying methodologies and tools from multiple disciplines and drawing on multiple lines of evidence; PLO 7: Critically assess the success of specific sustainability solutions over multiple timescales and from multiple perspectives, including the social, economic, and environmental impacts of different strategies.</p>	<p>Application of knowledge is a central principle in the design of the MES. Transdisciplinary study of environment and sustainability begins with a problem-centred approach, applying knowledge and methods from multiple disciplines in response to analysis of a specific problem in a given setting. Elements of the program that introduce students to this approach include: In the first term, in the required living lab course, ENV1103, students will undertake an applied research project on some aspect of campus sustainability, working in close partnership with operational staff. They will demonstrate the skills needed to work across disciplines and fields of study, and with non-academic partners. In the core research courses, ENV1197 & ENV1198, research methods will be tied to the contexts in which they apply, and students will encounter case studies of applied research in action.</p>
<p>4. Professional Capacity/Autonomy The qualities and transferable skills necessary for employment requiring</p> <ul style="list-style-type: none"> ▶ The exercise of initiative and of personal responsibility and accountability; and ▶ Decision-making in complex situations 	<p>To demonstrate Professional Capacity/Autonomy, MES graduates should be able to: PLO 9: Take responsibility for their own role as an advocate for sustainability in the organizations and communities they find themselves in, within the context of prevailing norms, value systems and ethical principles.</p>	<p>The MES will help students develop Professional Capacity/Autonomy in a number of ways: Mentoring by supervisor, advisory committee, and other faculty members. The thesis project, running throughout the program, will require students to demonstrate autonomy and exercise independent decision-making.</p>

Master's DLEs (based on the Ontario Council of Academic Vice-Presidents [OCAV])	Master's Program Learning Objectives and Outcomes	How the Program Design/Structure of the required courses and other learning activities supports the achievement of Program Learning Outcomes
Expectations: This Master of Environment and Sustainability is awarded to students who have demonstrated:		
<p>The intellectual independence required for continuing professional development;</p> <p>The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</p> <p>The ability to appreciate the broader implications of applying knowledge to particular contexts.</p>		<p>The core research course ENV1197 will introduce students to research ethics, and the development of an ethics protocol for their thesis projects.</p> <p>Students will be encouraged to participate in the life of the School of the Environment, the University, and the wider community, through the Graduate Students' Environmental Association, student representatives on relevant committees, and campus sustainability initiatives.</p>
<p>5. Communications Skills</p> <p>The ability to communicate ideas, issues and conclusions clearly.</p>	<p>To demonstrate Communications Skills, MES graduates should be able to:</p> <p>PLO 6: Communicate with clarity and accuracy using a variety of narrative structures to explain an issue and to build support for a proposed course of action among a broad cross-section of stakeholders;</p>	<p>Students will develop and consolidate their communication skills during the MES by:</p> <ul style="list-style-type: none"> Developing a literature review relevant to their thesis topic as part of the core research course, ENV1197; Presenting their work in the living lab course, ENV1103 to fellow students, partner organisations, and other stakeholders; Producing well-written papers for courses, research proposal, thesis, and peer-reviewed publications; Producing clear and effective oral presentations in classes, to partner organizations, and conference; Presenting their MES thesis in an oral defense to the advisory committee.
<p>6. Awareness of Limits of Knowledge</p> <p>Cognizance of the complexity of knowledge and of the potential contributions of other</p>	<p>To demonstrate Awareness of the Limits of Knowledge, MES graduates should be able to:</p> <p>PLO 7: Critically assess the success of specific sustainability solutions over multiple timescales and</p>	<p>The transdisciplinary approach of the MES emphasizes awareness of the limits of knowledge at all stages:</p> <p>In applied projects during the Living Lab course, ENV1103, students will learn how to assess success over</p>

Master’s DLEs (based on the Ontario Council of Academic Vice-Presidents [OCAV])	Master’s Program Learning Objectives and Outcomes	How the Program Design/Structure of the required courses and other learning activities supports the achievement of Program Learning Outcomes
<p>Expectations: This Master of Environment and Sustainability is awarded to students who have demonstrated:</p>		
<p>interpretations, methods, and disciplines.</p>	<p>from multiple perspectives, including the social, economic, and environmental impacts of different strategies. PLO 8: Critique the choices of problem framing and system boundaries in descriptions of environment and sustainability issues to identify uncertainties, missing voices, and missing sources of knowledge.</p>	<p>multiple timescales and from multiple perspectives; In the first core research course, ENV1197, students will discuss and critique the limitations of different discipline-based research strategies and learn about different perspectives on validity of knowledge produced in a variety of research methods; In the second core research course, ENV1198, students will practice these critical thinking skills to exemplars of research projects undertaken by the School’s research faculty; In their elective courses, students will apply these techniques to critically appraise a variety of case studies in environment and sustainability; In their thesis projects, students will be required to include an explicit discussion of limitations of their research.</p>

9 Assessment of Learning

- Appropriateness of the proposed methods for the assessment of student achievement of the intended program learning outcomes and degree-level expectations.
- Describe plans for documenting and demonstrating the level of performance of students consistent with the DLEs. (Assessment of Teaching and Learning examples in [Guide to Quality Assurance Processes](#)).

The research thesis is a core element of this program. The thesis will provide an opportunity for students to demonstrate critical and analytic thinking skills, problem-solving, synthesis of transdisciplinary perspectives, awareness of the limitations of knowledge, and the ability to communicate to others. The thesis will require students to develop an in-depth analysis of a critical environmental issue, or an analysis of a complex set of sustainability challenges, combined with appropriate strategies situated to respond to these challenges. At the same time, students will develop their scholarship, identifying and critiquing existing research in their chosen area, and demonstrating their ability to present and explain the issue and the strategies they have developed in a clear, coherent written form.

Work towards the thesis contributes to all of the Degree Level Expectations. Student performance and progress towards the thesis will be monitored and assessed in a number of ways. Students will meet regularly (at least every two weeks) with their individual supervisors for formative feedback throughout the program. At the end of the first term, as part of the assessment for ENV1197H, students will produce a written research proposal (including research questions, literature review, and proposed research methodology) which must be approved by their thesis committee. During the second term, in ENV1198H, students will give class presentations on their research progress. As part of the assessment for ENV1198H, students will be required to produce a research progress report with plans for completion, which again must be approved by their thesis committee. At each stage, the thesis committee will make recommendations for remedial action in cases where students are not meeting the Degree Level Expectations.

By the end of the program, students will demonstrate their mastery of all program learning outcomes by producing a written thesis, and presenting their research during the annual MES research symposium. The written thesis and the oral presentation will together be assessed using a rubric derived from the Program Learning Outcomes. There will be no final oral exam. If a student were to fail the thesis requirement, they would be given an opportunity to re-write the thesis, which would then be submitted to the thesis committee for approval. The thesis committee would decide whether the student must repeat the oral presentation; if this was deemed necessary, the student could present at one of several forums held throughout the academic year.

The Living Lab course, ENV1103H, will introduce students to the use of case studies, to demonstrate mastery of specific Master's Degree Level Expectations. These case studies require students to demonstrate the depth and breadth of their understanding of the social and economic contexts around environmentally or sustainability-related initiatives using

critical and analytical thinking skills to evaluate the case information and to generate alternatives in order to arrive at strategies, solutions and recommendations (PLO4, PLO5). Students will demonstrate their ability to evaluate critically the quantitative and qualitative information contained in the case to make judgments in accordance with underlying concepts (PLO1, PLO3). The case approach and applied nature of the students' work will reinforce their development of a sense of responsibility to society and an adherence to the highest level of integrity/ethical decision-making skills for the academic or professional contexts in which they will find themselves in the future (PLO9). Assessment in ENV1103H will include the students' ability to communicate their analysis of alternatives and recommendation in writing for both the specialist and non-specialist, adapting vocabulary and explanations as required (PLO6).

Assessment of learning in elective courses will use a variety of measures that include selected combinations of tests, exams and written assignments (such as essays, research papers, case study proposals, critical evaluation reports and self and group project evaluations), and oral presentations. The focus of these assignments will be on the depth, breadth, and application of knowledge (PLO2, PLO5), and the reinforcement of written and oral communication skills informed by the key concepts and techniques of the disciplines in the program (PLO6). Examinations may be comprised of short-answer and essay questions and will assess the students' ability to use critical and analytical thinking skills while demonstrating the depth and breadth of their knowledge as applied to the examination questions in a well-written format (PLO1, PLO2). In addition to summative assessments used to arrive at course grades, a number of formative techniques such as self and peer review and reflective writing will provide informal feedback to both the students and the professor – to students to allow them to measure their comprehension of material and their ability to analyze and synthesize concepts and theory as covered in the course and to the professor as feedback on student progress and comprehension of course material.

Throughout the program, students will be evaluated on the basis of their ability to analyze a given situation and potential set of challenges and opportunities (PLO5, PLO7). Emphasis will be placed on both individual and team-based assignments in the program which reflect the importance of the collaborative form of problem solving intrinsic to the environment and sustainability issues studied in the program, as well as the use of collaborative forms of assessment. The program's concentrations allow students to focus in one of four areas. All courses have been chosen to ensure they contribute to mastery of the program's learning outcomes.

The program learning outcomes outlined above will be measured against Degree Level Expectations within the MES (see Section 8: Degree Level Expectations). MES students will be evaluated according to how well they complete the work requested of them in terms of the substance and content of their responses, the clarity with which they can express their ideas and their ability to communicate their findings to a broad audience of both their peers, as well as practitioners in the field (professional capacity/ autonomy; level of communication skills).

Achievement of performance of students with respect to the DLEs will be performed annually by the School's graduate curriculum committee, and will include a review of the MES thesis rubric to identify any patterns of strength and weaknesses in student theses, and a survey of thesis supervisors to identify any issues in student achievement of the PLOs. The committee will then make recommendations to the Graduate Associate Director for adjustment of the program in response.

10 Program Description & Calendar Copy

- Provide a description of the program (audiences: prospective and current students, staff, and employers) that can be used for external and internal posting that includes the following information:
 - ▶ Program's purpose (who is it for, what are the outcomes)
 - ▶ Nature of learning environment (including mode of delivery)
 - ▶ Approaches to teaching/learning/assessment
- Provide, as an appendix, a clear and full calendar copy including:
 - ▶ The program description; the program requirements including all required courses and recommended electives and their prerequisites, including for any fields/concentrations.
- Provide as an appendix:
 - ▶ A full list of the all courses included in the program including course numbers, titles, and descriptions.
 - Please indicate clearly whether they are new/existing. (Please note that all new courses should be proposed and approved independently in line with established academic change procedures. Where possible, append full course proposals as an appendix).

Program Description

The Master of Environment and Sustainability (MES) is a full-time, one-year program designed for students seeking the transdisciplinary research skills needed to understand and develop solutions to the many environmental and human well-being challenges and opportunities facing us in the 21st century. The transdisciplinary perspective means research that (i) is problem-focussed, rather than discipline-focussed, starting from problems in the world and working back to the knowledge required to address those problems, and (ii) involves active engagement with non-academic partners in active processes of co-production of knowledge. The program builds on the strengths of the School of the Environment's undergraduate programs and its two interdisciplinary graduate Collaborative Specializations in Environmental Studies and Environment & Health. Upon graduation, MES students will have acquired a transdisciplinary perspective on environmental issues, learned to use methodologies and tools relevant to environmental protection and sustainability solutions, and will be well prepared for a variety of careers in the private and public sectors, or for further studies at the doctoral level.

Please see Appendix B for the full calendar copy.

Please see Appendix A for a full list of the course numbers and titles.

11 Consultation

- Describe the expected impact of what is being proposed on the nature and quality of other programs delivered by the unit/division.
- Describe the expected impact of what is being proposed on programs being offered by other units/divisions.
- Describe any consultation with the Deans of Faculties/divisions that will be implicated or affected by the creation of the proposed program as per UTQAP 2.4.2 "The Dean ensures that appropriate consultation is conducted with faculty and students, other university divisions and external institutions."

Initial informal discussions about developing a master's program (as the first new stand-alone graduate program in the School) started in 2014, along with consultations associated with the University of Toronto Quality Assurance Process review of the Environmental Studies Collaborative Specialization. A Graduate Program Planning Committee was established in March 2015 to develop a recommended plan for a stand-alone Master's program in consultation with all affected units and working closely with the Dean's Office in the Faculty

of Arts & Science. Membership of the Committee was chosen to ensure representation from the School's core constituencies.

As part of the consultation process, a memo was sent to all Faculty of Arts & Science Chairs, Principals and Directors, as well chairs of units outside Arts & Science that participate in the School's collaborative specializations, inviting feedback on the following questions:

1. Is there any convergence between the proposed MES and your unit's plans and priorities that could be used to the advantage of both?
2. The outline proposes three new faculty positions associated with the MES, in the broad areas of social sustainability, adaptation and resilience, and the sustainability transition, and suggests a few potential partner units for each. Would you be interested in having any of these positions as cross-appointments with your unit?
3. The outline also lists some possible elective courses. Are there any existing graduate courses in your unit that you would like to have included the MES program?
4. Do you have any comments on the outline? This is still a draft and we would welcome your input.

This led to email exchanges and/or meetings with the chairs of several units. These consultations resulted in two successful proposals for budgetary cross-appointments (with Chemistry and Computer Science) submitted to the Dean's Faculty Appointments Committee in March 2016, and two additional successful proposals (with Political Science and the Faculty of Architecture, Landscape, and Design) submitted in March 2017. All of these searches have now completed successfully, with faculty members in place for a roll-out of the MES in September 2020. Other departments are potentially interested in future cross-appointments.

A second memo was sent to the School of the Environment's graduate faculty (who span multiple units across the university) with these questions:

1. The proposed MES is a thesis-based program. Students will likely have a broader interdisciplinary focus than students within your home department. Would you be interested in potentially supervising the theses of MES students?
2. The MES outline proposes a number of new courses. Would you be interested in teaching any of the graduate courses described in the outline? If so, which ones?
3. The outline also lists some possible elective courses. Are there any existing graduate courses in your unit that you would like to have included the MES program?

4. Do you have any comments on the outline? This is still a draft and we would welcome your input.

A meeting was also held with Professor Dick Peltier, Director of the Centre for Global Change Science, to discuss the proposed Concentration 4: Global Change Science, and the associated new core course ENV1109 Special Topics in Global Change Science (July 14, 2016). He expressed support for this addition to the MES program, and thought the School of the Environment was a good home for an interdisciplinary course linked to the CGCS Distinguished Lecturer series.

This extensive consultation process resulted in very constructive feedback that has been incorporated into this proposal.

The proposal was also shared with the Tri-Campus Deans Committee, which includes vice-decanal representation from UTM and UTSC. The UTM Vice-Dean, Teaching and Learning and the UTSC Vice-Dean, Graduate shared the proposal with relevant units and faculty in their divisions, and relayed consolidated feedback to the Office of the Dean, Arts & Science. UTM and UTSC expressed overall support for the MES, finding it to be complementary with their Master's level, environment-focused degree programs (the MScSM at UTM, and the MEnvSci at UTSC). Feedback received from these consultations has been incorporated into this proposal, including more clearly defining the orientation of the MES and the distinctions between the MES, the MScSM and the MEnvSci in areas where overlap might be perceived to exist.

As noted in Section 5, in addition to these consultations the directors of the MScSM, MEnvSci and the School of the Environment (MES) met in the Fall of 2019 to map out the characteristics of the three programs in order to clearly define their differences (see Table 2). Going forward, this table will be used in recruitment materials to ensure that potential applicants apply to the program that is best suited to their interests and goals.

12 Resources

12.1 Faculty

- Complete the table below
- Brief commentary to provide:

- ▶ Evidence of the participation of a sufficient number and quality of faculty who will actively participate in the delivery of (teach and/or supervise) the program
 - ▶ Evidence of and planning for adequate numbers and quality of faculty and staff to achieve the goals of the program
 - ▶ That faculty have the recent research or professional/clinical expertise needed to sustain the program, promote innovation and foster an appropriate intellectual climate
 - ▶ of how supervisory loads will be distributed, and the qualifications and appointment status of faculty who will provide instruction and supervision
 - ▶ Planned/anticipated class sizes (connect this to delivery method, Section 8 and assessment methods, Section 9)
 - ▶ If relevant, plans and commitment to provide additional faculty resources to support the program.
 - ▶ The role of any adjunct or contractual (e.g., stipendiary) faculty.
- Provide the CVs of all faculty who appear in Table 6, as evidence substantiating the above. The appendix should form a separate document with a table of contents and all CVs in alphabetical order. CVs should be submitted in a consistent format.

The MES program will be based upon both existing expertise of faculty and a long-range vision for the future evolution of the School of the Environment. Graduate supervisors and course instructors for the MES will be drawn from the School's pool of ~120 graduate faculty members, including cross-appointed core faculty, who supervise the School's graduate Collaborative Specialization students.

Current resources at the School of the Environment provide a strong basis for the program, with nine recent hires bringing new expertise spanning topics across the four concentrations. Since the creation of the School, eight new tenure-stream faculty have been recruited in budgetary cross-appointments with the Departments of Political Science, Physics, Ecology & Evolutionary Biology, Chemistry, Computer Science, the Munk School of Global Affairs and the Faculty of Landscape, Architecture and Design, as well as a three-year CLTA in the area of religion and the environment. All of these faculty are now in place at the School, with the exception of the newly appointed faculty member cross-appointed with Computer Science, who will start in July 2020 after completing a postdoc.

These new hires bring the total faculty complement at the School to 15, comprising 11 cross-appointed tenure-stream faculty (equivalent to 5.14 FTE), two research-active CLTA faculty

(1.25 FTE), two academic administrative faculty seconded from other departments, and one teaching stream faculty (1.0 FTE). The full-time equivalent of 7.39 faculty represents a teaching capacity of ~28 half course equivalents (HCE), assuming normal course loads. Based on current and anticipated teaching assignments, this corresponds to ~19 HCE of undergraduate courses and ~9 HCE of graduate courses, some of which are joint courses with the faculty member's primary unit. This teaching capacity is more than sufficient for the program: the electives and the core course ENV1103H are already being offered in existing programs, and the two new core courses, ENV1197H and ENV1198H, will be covered within the school's graduate teaching capacity. ENV1197H and ENV1198H will be team taught by several faculty, with different faculty members rotating through the team year-by-year, to give the necessary broad inter-disciplinary perspective.

Table 6: Faculty Complement (please list alphabetically)

Name	Unit of Primary Budgetary Appt & %	Unit of Other Budgetary Appt and % (if applicable)	Graduate Faculty Membership Status (e.g., Associate/ Full privileges)	Commitment to other programs (please list other programs in which the person routinely teaches/ supervises)	Nature of contribution to this program (course instructor [CI], thesis supervision [TS])
Tenure Stream: Full					
Steve Easterbrook	Computer Science (100%)	n/a	Full Member, Dept of Computer Science & School of the Environment	Computer Science Programs (MSc, MScAC, PhD)	CI, TS
Scott Prudham	Geography (67%)	Env (33%)	Full Member, Dept Geography and Planning & School of the Environment	Geography Programs (MA, MSc, PhD); Environmental Studies (CS)	CI, TS
John Robinson	Munk (51%)	Env (49%)	Full Member, Munk School of Global Affairs and Public Policy & School of the Environment	Global Affairs (MGA); Environmental Studies (CS)	CI, TS Core course ENV1103

Name	Unit of Primary Budgetary Appt & %	Unit of Other Budgetary Appt and % (if applicable)	Graduate Faculty Membership Status (e.g., Associate/ Full privileges)	Commitment to other programs (please list other programs in which the person routinely teaches/ supervises)	Nature of contribution to this program (course instructor [CI], thesis supervision [TS])
Kimberly Strong	Physics (100%)	n/a	Full Member Dept of Physics; School of the Environment	Physics Programs (MSc, PhD)	TS
Tenure Stream: Associate					
Christian Abizaid	Geography (51%)	Env (49%)	Full Member, Graduate Dept of Geography and Planning; School of the Environment	Geography Programs (MA, MSc, PhD); Environmental Studies (CS)	CI, TS
Jessica Green	Political Sci (51%)	Env (49%)	Full Member, School of the Environment	Environmental Studies (CS)	CI, TS
Stephen Scharper	Anthropology (60%)	Env (40%)	Full Member, Dept of Religion; School of the Environment	Religion (MA, PhD); Environmental Studies (CS)	CI, TS
Debra Wunch	Physics (51%)	Env (49%)	Full Member Dept of Physics; School of the Environment	(none)	CI, TS
Tenure Stream: Assistant					
Alstan Jakubiec	FALD (51%)	Env (49%)	TBD	Architecture programs (MArch)	TS
Kate Neville	Political Sci (51%)	Env (49%)	Associate Member, Dept of Political Science; School of the Environment	Political Science Programs (MA, PhD); Environmental Studies (CS)	CI, TS
Hui Peng	Chemistry (51%)	Env (49%)	Associate Member, Dept of Chemistry; School of the Environment	Chemistry Programs (MSc, PhD); Environment and Health (CS)	TS

Name	Unit of Primary Budgetary Appt & %	Unit of Other Budgetary Appt and % (if applicable)	Graduate Faculty Membership Status (e.g., Associate/ Full privileges)	Commitment to other programs (please list other programs in which the person routinely teaches/ supervises)	Nature of contribution to this program (course instructor [CI], thesis supervision [TS])
Njal Rollinson	EEB (51%)	Env (49%)	Full Member, Dept of Ecology and Evolutionary Biology; School of the Environment	Ecology and Evolutionary Biology Programs (MSc, PhD); Environment and Health (CS)	TS
Robert Soden	Computer Science (51%)	Env (49%)	TBD	TBD	CI, TS
Teaching Stream: Associate					
Karen Ing	Env (100%)		TBD	(none)	TS
Non-Tenure Stream (i.e., CLTA)					
Clare Wiseman	Env (75%)		Full Member, School of the Environment	Environment and Health (CS)	CI, TS
Tanhum Yoreh	Env (75%)		Associate Member, School of the Environment	Environmental Studies (CS)	CI, TS

12.2 Learning Resources

- Evidence that there are adequate resources to sustain the quality of scholarship and research activities of undergraduate and graduate students, including library support

Please see the following appendices:

Appendix C: Library statement confirming the adequacy of library holdings and support for student learning.

Appendix D: Standard statement concerning student support services.

12.3 Financial Support for Graduate Students

- Where appropriate to the program, evidence that financial assistance for students will be sufficient to ensure adequate quality and numbers of students.

Students in the MES program will be eligible for, and will receive, various types of financial support offered by the Faculty of Arts & Science and the School of the Environment. While the MES program will be an unfunded program in the sense that it is outside the Faculty of Arts & Science base funding model (i.e., students will not receive a base funding package), regularized and consistent funding will be available to MES students. The School of the Environment has several endowed funds and endowed scholarships that will be used for graduate student support, as well as plentiful opportunities for research and teaching assistantships (RA, TA). The School's undergraduate courses typically require about 4200 TA hours per year. In principle, all of these hours could be offered to MES students. For example, 10-15 students with 180 TA hours each equals 1800-2700 TA hours, which is about half of the available hours. In addition, each MES student will receive a research stipend of \$1500 as the nominal supervisor contribution, paid from the supervisor's research grants.

Scholarship, TA and RA funding will be supplemented by Arts & Science funding which is provided to units in support of their graduate programs. The School of the Environment will draw upon these funds to provide direct financial support to MES students, for example in the form of stipends or recruitment awards.

12.4 Space/Infrastructure

- Evidence that there are adequate resources to sustain the quality of scholarship and research activities of undergraduate and graduate students, including information technology support and laboratory access; address any unique requirements including renovations to existing space, new space, equipment, etc.
- Note: The requirements for physical facilities should be identified by providing information on the change in the number of people to be accommodated by type (i.e., faculty, students, administrative staff, etc.) as well as information on changes in equipment and activities requiring accommodation. The division/Faculty should state

whether it plans to bring forward proposals for additional space; the renovation of existing space; or whether the current space allocation to the academic program will accommodate the new initiative.

New dedicated office space will be available for MES students, as well as a graduate student lounge. A room for teaching assistants already exists, as does a dedicated classroom for graduate seminars. The School's existing space in the Earth Sciences Complex has been identified for renovation by the Faculty of Arts & Science to provide facilities for graduate students, as well as some additional needed faculty office and laboratory space. Further space needs will be met with the School's planned move to a larger building, anticipated for 2022-2023.

12.5 Other Resource Implications

- For example,
 - ▶ Is a new graduate unit contemplated that would require a separate graduate chair appointed under the PAAA?
 - ▶ Are there interdivisional teaching implications?
 - ▶ Will the new program affect any existing agreements with other institutions, or require the creation of a new agreement to facilitate the new program (e.g., Memorandum of Understanding, Memorandum of Agreement, etc.). (Existing joint programs are offered with Centennial, Sheridan and Michener.)
 - ▶ If this is a new joint program, please indicate how future reviews of the program will be conducted in accordance with UTQAP 2.1: "Where a program is held jointly with an Ontario institution that does not have an IQAP that has been ratified by the Quality Council, the UTQAP will serve as the guiding document and University of Toronto will be the lead institution. Where a program is held jointly with an Ontario institution that does have an IQAP that has been ratified by the Quality Council, a lead institution will be selected. Program proposals specify how future reviews will be conducted."
- Please consult with the Provost's office (vp.academicprograms@utoronto.ca) early regarding any resource implications described in this section.

There are no resource implications other than those discussed above. The School was established as a graduate unit when it was created in 2012. Core faculty to the school hold budgetary appointments within the school (typically 49%), and typically contribute half their teaching load to the school's courses, as per existing agreements with their home departments/faculties.

13 Quality and Other Indicators

- Please describe the appropriateness of the faculty's collective expertise and how it contributes substantively to the proposed program. Define and use indicators to provide evidence of the quality of the faculty (e.g., qualifications, research, innovation and scholarly record)
- Please explain how the program structure and faculty research will ensure the intellectual quality of the student experience.
- Please describe any elements that enhance the program's diversity.

The MES program will be able to draw on the wealth of expertise in environment and sustainability at the University, giving its students access to internationally recognized researchers and educators who span multiple disciplines. No other university in Canada can offer students the breadth and depth of environment-related scholarship found at the University of Toronto. The School of the Environment operates on a 'hub-and-spoke' model. Its programs combine core courses with broader collaborative arrangements with other departments, campuses, and Faculties. The 'hub' is sustained by a complement of 15 core faculty members. The core faculty of the school all lead active research programs, and are the recipients of awards and grants from the Social Sciences and Humanities Research Council (SSHRC), the Natural Sciences and Engineering Research Council (NSERC), Environment and Climate Change Canada, Health Canada, the Canadian Space Agency, the Canada Foundation for Innovation, the Ontario Centres of Excellence, the Metcalf Foundation, and others.

The 'spokes' are maintained through the appointment of more than 120 graduate faculty members from across the university, who serve as full members of the graduate unit, meaning that they are approved by the School of Graduate Studies to teach or supervise graduate students within the School's programs. Some of these faculty also teach the School's

undergraduate courses. These graduate faculty members include international leaders in many different disciplines related to environment and sustainability, as evidenced by their extensive collection of published research.

Appendix A: Courses

Mandatory Courses:

Table A1: Summary of core courses for the MES program and potential instructors.

MES Mandatory Core Courses	Anticipated Instructors
ENV1103H The U of T Campus as a Living Lab of Sustainability (existing course)	John Robinson
ENV1197H Research in Environment and Sustainability, Part 1 (new course)	Team taught by 2-3 core faculty (in rotation) from the School of the Environment, to provide a broad set of transdisciplinary perspectives
ENV1198H Research in Environment and Sustainability, Part 2 (new course)	Team taught by 2-3 core faculty (in rotation) from the School of the Environment, with guest lectures from all MES thesis supervisors
ENV1199Y Thesis (new course)	Multiple faculty – MES thesis supervisors, primarily from the School's core faculty. We anticipate that some members of the School's larger pool of graduate faculty may wish to supervise theses from time to time.

All students enrolled in the MES will take one mandatory shared course: ENV1103H The U of T Campus as a Living Lab of Sustainability, and three mandatory research-related courses: ENV1197H Research in Environment and Sustainability, Part 1; ENV1198H Research in Environment and Sustainability, Part 2; and ENV1199Y Thesis. They will also choose three electives from the existing courses as described below (with additional courses to be introduced in the future as resources allow). All new courses, with the exception of ENV1197H, ENV1198H, and ENV1199Y, will also be made available to students in our Collaborative Specializations.

Mandatory core course (existing):

ENV1103H The U of T Campus as a Living Lab of Sustainability (Fall term)

Sustainability is a growing priority for universities all over the world. Many are developing strong operational sustainability goals and targets, and are giving increasing emphasis to teaching and research on sustainability issues. Yet few have committed at the executive level to integrating academic and operational sustainability in the context of treating their campus as a living laboratory of sustainable practice, research and teaching. Arguably, it is such living lab approaches that offer the largest potential for universities to play a significant role in the sustainability transition. This course will explore and apply the living lab concept, in the context

of operational sustainability at the University of Toronto. We will begin by looking at the literature on university sustainability and the living lab concept. The bulk of the course will involve undertaking an applied research project on some aspect of campus sustainability, working in close partnership with operational staff at the University of Toronto. Students will develop the skills needed to work across disciplines and fields of study, and with non-academic partners.

Mandatory research course (new):

ENV1197H Research in Environment and Sustainability, Part 1 (Fall term)

This required course will involve initial research to identify and develop the thesis topic, and will bring students together in series of seminars on transdisciplinary research methods in environment and sustainability. Students will prepare a 5-10 page research proposal that includes a description of the research topic, a literature review, a discussion of the proposed methodology, and will be written and approved, along with a selection of concentration, by end of the Fall term. All MES students will take this course, attending the seminars and working individually with their supervisor. A major component of the grade for this course will be provided by the supervisor, based on the supervisor's evaluation of the ability and progress of the student in performing research as evidenced in interactions with the student throughout the term.

Mandatory research course (new):

ENV1198H Research in Environment and Sustainability, Part 2 (Spring term)

This required course will involve research on the thesis topic, developing a detailed research plan and preparing for data collection, fieldwork, or equivalent, based on the 5-10 page research proposal written in the preceding Fall term. Seminars every two weeks will bring the students together for invited talks from faculty members, in which they present examples of recent research projects, and discuss difficulties encountered and how they were overcome. All students will take this course, attending seminars and working individually with their supervisor. A major component of the grade for this course will be provided by the supervisor, based on the supervisor's evaluation of the ability and progress of the student in performing research as evidenced in interactions with the student throughout the term.

Mandatory research course (new):

ENV1199Y Thesis

This is a required course that students will take in the Summer term, working individually with their supervisor. It follows on the development of the research proposal and completion of ENV1197 in the Fall term and the completion of ENV1198 in the Spring term. During the Summer term, students will complete their research and write up their thesis by the end of August. This will be followed by a presentation to faculty and other students that will involve all graduating students over 1-2 day period. The thesis should be no longer than 15,000 words. To encourage transdisciplinary perspectives, each MES student will have an advisory committee comprised of the primary supervisor and two other faculty members from at least two disciplines or departments.

Elective Courses

All students enrolled in the MES will take three elective courses, chosen in consultation with their supervisors, to provide breadth and depth relevant to their research focus. Students will be given guidance by the supervisor and advisory committee regarding the selection of electives. The electives will be drawn from existing courses and from new courses introduced as resources allow. The existing courses listed in Table A2 are either ENV courses, current courses included as electives in the Environmental Studies or Environment & Health Collaborative Specializations, or were suggested for inclusion during the MES consultation process. These lists are not exhaustive – additional courses could be added from a number of other programs and units.

Table A2: Summary of MES Elective Courses. Instructors are shown for courses taught by School of the Environment Faculty.

Concentration 1: Social Sustainability	
ENV1001 Environmental Decision Making	Kate Neville, Tanhum Yoreh
ENV1008 Worldviews and Ecology	Stephen Scharper
ENV1444 Capitalist Nature	Scott Prudham
ENV1701 Environmental Law	Paul Muldoon (adjunct faculty, long-term sessional)
ENV4001 Graduate Seminars in Environment and Health	Clare Wiseman
ENV4002 The Environment and Health of Vulnerable Populations	TBD
JGE1425 Livelihoods, Poverty and Environment in Developing Countries	Christian Abizaid
JSE1708 The Development of Sustainability Thought	John Robinson
ANT3034 Anthropology of Food Security	Taught by graduate faculty member (GFM) in Dept of Anthropology, Faculty of Arts and Science (FAS)
ANT6018 Theories of Nature and Society	GFM in Dept. Anthropology (FAS)
DRA3903 Modern Drama's Environments	GFM in Centre for Drama, Theatre, & Performance Studies (FAS)

HSJ1909 Environmental Sustainability and Social Justice I	GFM in Ontario Institute for Studies in Education (OISE)
JEI1901 Technology, Society and the Environment I	GFM in Dept of Mechanical & Industrial Engineering (FASE)
JEI1902 Technology, Society and the Environment II	GFM in Dept of Mechanical & Industrial Engineering (FASE)
JPG1426 Natural Resource, Difference and Conflict	GFM in Dept of Geography & Planning (FAS)
JPG1518 Sustainability and Urban Communities	GFM in Dept of Geography & Planning (FAS)
JPG1672 Land and Justice	GFM in Dept of Geography and Planning (FAS)
LHA1104 Community Education and Organizing	GFM in Ontario Institute for Studies in Education (OISE)
LHA1160 Introduction to Transformative Learning Studies	GFM in Ontario Institute for Studies in Education (OISE)
LHA1193 Adult Education for Sustainability	GFM in Ontario Institute for Studies in Education (OISE)
LHA1837 Environmental Health Transformative Higher Education and Policy Change Education Toward Social and Ecosystem Healing	GFM in Ontario Institute for Studies in Education (OISE)
POL2173 Advanced Canadian Environmental Policy	GFM in Dept of Political Science (FAS)
POL2213 Global Environmental Politics	Kate Neville
Concentration 2: Adaptation and Resilience	
ENV1001 Environmental Decision Making	Kate Neville, Tanhum Yoreh
CSC2720 Systems Thinking for Global Problems	Steve Easterbrook
ENV1004 Urban Sustainability and Ecological Technology	TBD
ENV1703 Water Resources Management	Romila Verma (long-term sessional)
ENV1704 Risk Analysis & Management	Chris Ollson (long-term sessional)
ENV4002 The Environment and Health of Vulnerable Populations	TBD
CHL5413 Public Health Sanitation	GFM in Dalla Lana School of Public Health
CHL5903 Environmental Health	GFM in Dalla Lana School of Public Health
CHL5911 Occupational and Environmental Hygiene II	GFM in Dalla Lana School of Public Health
ESS2304 Contaminants in the Environment	GFM in Dept of Earth Sciences (FAS)
FOR1416 Forest Fire Danger Rating	GFM in Faculty of Forestry
FOR1575 Urban Forest Conservation	GFM in Faculty of Forestry
JGE1413 Workshop in Environmental Assessment	GFM in Dept of Geography and Planning (FAS)
JGE1420 Urban Waste Management: An International Perspective	GFM in Dept of Geography and Planning (FAS)
JGE1425 Livelihoods, Poverty and Environment in Developing Countries	GFM in Dept of Geography and Planning (FAS)
JNC2503 Environmental Pathways	GFM in Dept of Chemical Engineering and Applied Chemistry (FASE)

JPG1404 Issues in Global Warming	GFM in Dept of Geography and Planning (FAS)
JPG1428 Managing Urban Ecosystems	GFM in Dept of Geography and Planning (FAS)
PLA1601 Environmental Planning and Policy	GFM in Dept of Geography and Planning (FAS)
Concentration 3: The Sustainability Transition	
ENV1001 Environmental Decision Making	Kate Neville, Tanhum Yoreh
ENV1002 Environmental Policy	Jessica Green
ENV1005 Business and Environmental Politics	TBD
ENV1444 Capitalist Nature	Scott Prudham
ENV1707 Environmental Finance: Risk Management and Business Opportunities	Sue McGeachie (adjunct faculty, long-term sessional)
CIV1307 Sustainability and Life Cycle Assessment of Engineering Activities	GFM in Dept of Civil Engineering (FASE)
ECO2908 Environmental and Resource Economics	GFM in Dept of Economics (FAS)
FOR1270 Forest Biomaterial Sciences	GFM in Faculty of Forestry
FOR1288 Design and Manufacturing of Biomaterials	GFM in Faculty of Forestry
GGR1408 Carbon-Free Energy	GFM in Dept of Geography and Planning (FAS)
JFG1610 Sustainable Forest Management and Certification	GFM in Dept of Geography and Planning (FAS) or Faculty of Forestry
JFS1460 Community Based Natural Resource Management	GFM in Dept of Geography and Planning (FAS) or Faculty of Forestry
JPG1407 Efficient Use of Energy	GFM in Dept of Geography and Planning (FAS)
JPG1518 Sustainability and Urban Communities	GFM in Dept of Geography and Planning (FAS)
Concentration 4: Global Change Science	
ENV1001 Environmental Decision Making	Kate Neville, Tanhum Yoreh
CHM1410 Analytical Environmental Chemistry	Hui Peng
ANT4065 Archeology and Climate Change	GFM in Dept. Anthropology (FAS)
CHE1435 Aerosol Physics and Chemistry	GFM in Dept of Chemical Engineering and Applied Chemistry (FASE)
CHM1401 Transport and Fate of Chemical Species in the Environment	GFM in Dept of Chemistry (FAS)
CHM1420 Environmental Chemistry of Soil	GFM in Dept of Chemistry (FAS)
CHM1425 Modelling the Fate of Organic Chemicals in the Environment	GFM in Dept of Chemistry (FAS)
ESS1461 Paleoenvironmental Studies	GFM in Dept of Earth Sciences (FAS)
FOR3000 Current Issues in Forest Conservation	GFM in Faculty of Forestry
GLG2303 Earth Systems Evolution	GFM in Dept of Earth Sciences (FAS)
GRG1213 Global Ecology and Biogeochemical Cycles	GFM in Dept of Earth Sciences (FAS)
PHY1498 Introduction to Atmospheric Physics	GFM in Dept of Physics (FAS)
PHY2506 Data Assimilation and Retrieval Theory	GFM in Dept of Physics (FAS)
PHY2502 Climate System Dynamics	GFM in Dept of Physics (FAS)
PHY2504 Advanced Atmospheric Dynamics	GFM in Dept of Physics (FAS)
PHY2505 Atmospheric Radiative Transfer and Remote Sounding	GFM in Dept of Physics (FAS)

Appendix B: Graduate Calendar Copy

School of Environment

Master of Environment and Sustainability (MES)

Overview:

The Master of Environment and Sustainability (MES) is a full-time, one-year program designed for students seeking the transdisciplinary research skills needed to understand and develop solutions to the many environmental and human well-being challenges and opportunities facing us in the 21st century. The transdisciplinary perspective means research that (i) is problem-focussed, rather than discipline-focussed, starting from problems in the world and working back to the knowledge required to address those problems, and (ii) involves active engagement with non-academic partners in active processes of co-production of knowledge. The program builds on the strengths of the School's undergraduate programs and its two interdisciplinary graduate Collaborative Specializations in Environmental Studies and Environment & Health. Upon graduation, MES students will have acquired a transdisciplinary perspective on environmental issues, learned to use methodologies and tools relevant to environmental protection and sustainability solutions, and will be well prepared for a variety of careers in the private and public sectors, or for further studies at the doctoral level.

Minimum Admission Requirements:

Applicants are accepted under the general regulations of the School of Graduate Studies. In addition, applicants must meet the following requirements:

- An appropriate honours bachelor's degree (HBA or HBA) that includes at least a minor in environment, sustainability or a closely related field from a recognized university with a minimum standing equivalent to at least a University of Toronto B+ in each of the final two years of study.
- Applicants should have completed a combination of major(s) and minor(s) spanning more than one discipline or have equivalent interdisciplinary experience.
- A letter of intent.
- Two (2) letters of reference.

Program Requirements:

Students undertake research leading to the preparation of a thesis, in conjunction with the equivalent of 4.0 FCEs in coursework including:

- 1.5 FCE Core courses (ENV1103H, ENV1197H, ENV1198H)
- 1.0 FCE Thesis (ENV1199Y)
- 1.5 FCE Electives, chosen from the list below, from one of four specializations.

Program Length: 3 sessions full-time

Time Limit: 3 years full-time

Course List:

Core Courses (2.5 full credits):

- ENV1103H The U of T Campus as a Living Lab of Sustainability
- ENV1197H Research in Environment and Sustainability, Part 1
- ENV1198H Research in Environment and Sustainability, Part 2
- ENV1199Y Thesis

Elective Courses (1.5 full credits), chosen from one of the following concentrations

Concentration 1: Social Sustainability

- ENV1008 Worldviews and Ecology
- ENV1444 Capitalist Nature
- ENV1701 Environmental Law
- ENV4001 Seminars in Environment and Health
- ENV4002 The Environment and Health of Vulnerable Populations
- JGE1425 Livelihoods, Poverty and Environment in Developing Countries
- ANT3034 Anthropology of Food Security
- ANT6018 Theories of Nature and Society
- DRA3903 Modern Drama's Environments
- HSJ1909 Environmental Sustainability and Social Justice I
- JEI1901 Technology, Society and the Environment I
- JEI1902 Technology, Society and the Environment II
- JPG1426 Natural Resource, Difference and Conflict
- JPG1518 Sustainability and Urban Communities
- JPG1672 Land and Justice

- LHA1104 Community Education and Organizing
- LHA1160 Introduction to Transformative Learning Studies
- LHA1193 Adult Education for Sustainability
- LHA1837 Environmental Health Transformative Higher Education and Policy Change Education Toward Social and Ecosystem Healing
- POL2173 Advanced Canadian Environmental Policy
- POL2213 Global Environmental Politics

Concentration 2: Adaptation and Resilience

- ENV1004 Urban Sustainability and Ecological Technology
- ENV1703 Water Resources Management and Policy
- ENV1704 Environmental Risk Analysis and Management
- ENV4002 The Environment and Health of Vulnerable Populations
- CHL5413 Public Health Sanitation
- CHL5903 Environmental Health
- CHL5911 Occupational and Environmental Hygiene II
- CSC2720 Systems Thinking for Global Problems
- ESS2304 Contaminants in the Environment
- FOR1416 Forest Fire Danger Rating
- FOR1575 Urban Forest Conservation
- JGE1413 Workshop in Environmental Assessment
- JGE1420 Urban Waste Management: An International Perspective
- JGE1425 Livelihoods, Poverty and Environment in Developing Countries
- JNC2503 Environmental Pathways
- JPG1404 Issues in Global Warming
- JPG1428 Managing Urban Ecosystems
- PLA1601 Environmental Planning and Policy
- New joint Geography/DPES course: Climate Change Adaptation

Concentration 3: The Sustainability Transition

- ENV1002 Environmental Policy
- ENV1005 Business and Environmental Politics
- ENV1444 Capitalist Nature
- ENV1707 Environmental Finance and Sustainable Investing

- CIV1307 Sustainability and Life Cycle Assessment of Engineering Activities
- ECO2908 Environmental and Resource Economics
- FOR1270 Forest Biomaterial Sciences
- FOR1288 Design and Manufacturing of Biomaterials
- FOR1294 Bioenergy and Biorefinery Technology
- GGR1408 Carbon-Free Energy
- JFG1610 Sustainable Forest Management and Certification
- JFS1460 Community Based Natural Resource Management
- JPG1407 Efficient Use of Energy
- JPG1518 Sustainability and Urban Communities
- New joint Geography/DPES course: Climate Change Policy

Concentration 4: Global Change Science

- ANT4065 Archeology and Climate Change
- CHE1435 Aerosol Physics and Chemistry
- CHM1401 Transport and Fate of Chemical Species in the Environment
- CHM1410 Analytical Environmental Chemistry
- CHM1420 Environmental Chemistry of Soil
- CHM1425 Modelling the Fate of Organic Chemicals in the Environment
- ESS1461 Paleoenvironmental Studies
- FOR3000 Current Issues in Forest Conservation
- GLG2303 Earth Systems Evolution
- GRG1213 Global Ecology and Biogeochemical Cycles
- PHY1498 Introduction to Atmospheric Physics
- PHY2506 Data Assimilation and Retrieval Theory
- PHY2502 Climate System Dynamics
- PHY2504 Advanced Atmospheric Dynamics
- PHY2505 Atmospheric Radiative Transfer and Remote Sounding

Appendix C: Library Statement

University of Toronto Libraries Report for Master of Environment & Sustainability, School of the Environment/University of Toronto, November 20, 2018

Context: The University of Toronto Library (UTL) system is the largest academic library in Canada and is currently ranked 6th among academic research libraries in North America.³ The UTL has an annual acquisition budget of \$31 million. Its research and special collections comprise over 12 million print volumes, 5.6 million microforms, over 17,000 journal subscriptions, and rich collections of manuscripts, films, and cartographic materials. The system provides access to more than 1.9 million electronic books, journals, and primary source materials.⁴ Numerous, wide-ranging collections, facilities and staff expertise reflect the breadth of research and instructional programs at the University, and attract unique donations of books and manuscripts from around the world, which in turn draw scholars for research and graduate work.

Major North American Research Libraries ⁵					
	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
ARL RANK	UNIVERSITY	UNIVERSITY	UNIVERSITY	UNIVERSITY	UNIVERSITY
1	Harvard	Harvard	Harvard	Harvard	Harvard
2	Yale	Yale	Yale	Yale	Yale
3	Toronto (3rd)	Toronto (3rd)	Toronto (3rd)	Columbia	Michigan
4	Columbia	Columbia	Columbia	Toronto (4th)	Columbia
5	Michigan	Michigan	Michigan	Michigan	New York
6					Toronto (6th)

Top 5 Canadian Universities in the ARL Ranking of Major North American Research Libraries				
2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
RANK/UNIVERSITY	RANK/UNIVERSITY	RANK/UNIVERSITY	RANK/UNIVERSITY	RANK/UNIVERSITY
3/Toronto	3/Toronto	3/Toronto	4/Toronto	6/Toronto

³ Chronicle of Higher Education (2017). Spending by University Libraries, 2015-16. *Almanac of Higher Education 2017 – 2018*, LXIII (43), 64.

⁴ Figures as of 2015 taken from UTL's 2016 Annual Report.

<http://www.library.utoronto.ca/library/aboutlibraries/annualreport/2016/AnnualReportUTL2016.pdf>

⁵ Chronicle of Higher Education (2017). Spending by University Libraries, 2015-16. *Almanac of Higher Education 2017 – 2018*, LXIII (43), 64.

10/British Columbia	18/Alberta	22/British Columbia	27/Alberta	31/Alberta
15/Alberta	24/British Columbia	26/Alberta	31/British Columbia	35/British Columbia
18/McGill	30/McGill	35/McGill	43/McGill	42/McGill
32/Montreal	35/Montreal	36/Montreal	49/Calgary	63/Calgary

Space and Access Services: The UTL's 42 libraries are divided into four administrative groups: Central, Departmental/local, Campus (UTM & UTSC) and Federated and Affiliated College Libraries. The UTL provides a variety of individual and group study spaces for students. Study space and computer facilities are available twenty four hours, five days per week at one location, Robarts Library, with additional extended hours during study and exam periods at both UTSC and UTM. Web-based services and electronic materials are accessible at all times from campus or remote locations.

Teaching, Learning & Research Support: Libraries play an important role in the linking of teaching and research in the University. To this end, information literacy instruction is offered to assist in meeting Master of Environment & Sustainability degree level expectations in the ability to gather, evaluate and interpret information. Librarians collaborate with instructors on assignment design, provide student research consultations, and offer just-in-time student research help in person, by phone, or through online chat. Librarians are also available to support curriculum mapping initiatives. Special initiatives, such as the Libraries Undergraduate Research Prize, and an annual forum for student journal editors, extend information literacy beyond the classroom. These services align with the Association of College and Research Libraries (ACRL) *Framework for Information Literacy for Higher Education*.⁶

Program Specific Instructional Support: Instruction occurs at a variety of levels for the School of the Environment students and is provided by the faculty liaison librarian for Environmental Science. The Earth Sciences Library facilitates formal instruction integrated into the class schedule and hands-on tutorials related to course assignments. Library instruction has been conducted for ENV100 - Introduction to Environmental Studies, ENV223 - Fundamental Environmental Skills, and ENV234 - Environmental Biology. The Library, through its liaison librarians, customizes feeds of library resources which appear prominently in Portal/Quercus course pages. Library resource guides have been created for ENV100, ENV223, ENV235 - Physics and the Environment, ENV322 - International Environmental Policy, and ENV451 - Current Environmental Topics.

Collections: Many college and campus libraries collect materials in support of the School of the Environment; the largest collection of materials is centrally located in the Robarts Library. Collections are purchased in all formats to meet the variety of preferences and styles of our current students and faculty. The University of Toronto Library is committed to collecting both print and electronic materials in support of the School of the Environment at the University of Toronto.

⁶ Association of College & Research Libraries. Framework for Information Literacy for Higher Education. ACRL, 2016.

http://www.ala.org/acrl/sites/ala.org/acrl/files/content/issues/infolit/Framework_ILHE.pdf

Journals: The Library subscribes to 25 of the top 25 journals listed in Journal Citation Reports (JCR)⁷ in subject area Environmental Sciences. Of these titles, 25 are available electronically to staff and students of the University. We prioritize acquisition of online journals where possible.

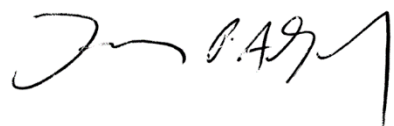
Monographs: The UTL maintains comprehensive book approval plans with 51 book vendors worldwide. These plans ensure that the Library receives academic monographs from publishers all over the world in an efficient manner. In support of the School of the Environment, monographs are purchased in electronic form where possible, and the Library currently receives all current e-books directly from the following publishers: Springer, Elsevier, Wiley, and Cambridge University Press.

Preservation, Digitization, and Open Access: The UTL supports open access to scholarly communication and research information through its institutional research repository (known as T-Space), its Downsview print repository, its open journal services, subscriptions to open access publications, and support for preservation of research materials in all formats. In addition to acquiring materials in support of the School of the Environment, the Library has digitized its monograph holdings published before 1923. These books are available without charge to any Internet user.

Key Databases: GreenFILE and Environmental Sciences & Pollution Management are two major databases the Library subscribes to in order to support School of the Environment programs.

Prepared by: Bruce Garrod, Head Librarian, Earth Sciences Library, November 20, 2018

Submitted by: Larry Alford, Chief Librarian, University of Toronto Libraries, May 24, 2019



⁷2017 Journal Citation Reports® (Thomson Reuters, 2018)

Appendix D: Student Support Services

Student service information for Quality Assurance Framework

[St. George Campus]

All University of Toronto undergraduate and graduate students have access to student services on all three campuses, Mississauga, St. George (downtown Toronto), and Scarborough, regardless of their 'home campus'. The services and co-curricular educational opportunities provide a complement to the formal curriculum by engaging and challenging students to reach their full potential as learners, leaders and citizens. At the University of Toronto (St. George Campus) these services are organized by Student Life Programs and Services, the academic division registrar offices, and the School of Graduate Studies. All these services combine to support the success of our students from the time they are admitted through degree completion and beyond.

Students have access to comprehensive physical and mental health care on campus, including a medical clinic, travel medicine services, immunization, contraception and sexual health education. Counselling and treatment options for psychological and emotional concerns include psychotherapy, group therapy and pharmacotherapy, as well as specialized assault counselling services provided both by the health and wellness centre and the Sexual Violence Prevention and Support Centre. In addition, a large number of wellness programs are provided, such as mindful meditation, workshops on coping skills and stress management.

Housing needs, including off-campus housing listings and resources for students living independently, are met through the Student Housing Service.

Coaching and education in the development of key learning skills – from time management to overcoming exam anxiety – is provided through the Academic Success Centre. The ASC also partners with faculty to integrate success strategies and support into the curriculum.

Students' career exploration and employment services are provided through a Career Centre offering resume and interview coaching, workshops, career resources, on and off-campus employment and volunteer listings, job shadowing, and career counseling.

Specialized services are provided for international students (orientation, advising, cross-cultural counselling), students with disabilities (academic accommodations, advising), students with children or other family responsibilities (advising, resources, subsidized child care), Indigenous

students (academic support, financial counselling) and lesbian, gay, bisexual and transgender students (counselling, referrals, equity outreach and engagement).

Participation in campus life and experiential learning are facilitated through Hart House (clubs, committees, events), the Centre for Community Partnerships (service learning and volunteer opportunities in community settings), the Multifaith Centre (interfaith dialogue, events), and the Student and Campus Development (leadership development, orientation, recognition and support for student groups, activities.) Sport and recreational facilities and programs are provided to all students through both Hart House and the Faculty of Kinesiology and Physical Education.

At Arts & Science, graduate students may also access:

- registrarial services and academic advising through their departments;
- writing instruction and support programs provided through the Faculty's Milestones & Pathways program;
- discipline or sector-specific professional development; provided through departments and through the Milestones & Pathways program
- student activity spaces

School of Graduate Studies, Student Services [all campuses]

In addition to the above services available to all students, graduate students have access to registrarial services and co-curricular programs at the School of Graduate Studies that assist students in meeting their academic goals.

Administrative staff at the School of Graduate Studies (SGS) provide registrarial services to graduate students including but not limited to recruitment, admission, orientation, registration, fees, program progress, awards/financial assistance and graduation. Fully equipped meeting rooms, which can be booked by student groups when not used for Final Oral Examinations, are distributed across two locations, the newly renovated 63 St. George Street (home of SGS Student Services) and 65 St. George Street. Financial advising and wellness counselling services are also available at 63 St. George.

The Grad Room is an accessible space on the St. George campus which provides University of Toronto graduate students with a lounge area and a multi-purpose space for academic, social and professional graduate student programming. An additional lounge area for graduate students is now available at 63 St. George.

Grad Room is home to the Graduate Professional Skills Program (GPS). GPS is a non-academic program presented by SGS consisting of a variety of offerings that provide doctoral stream students a range of opportunities for professional skills development. The program focuses on skills beyond those conventionally learned within a disciplinary program, skills that may be critical to success in the wide range of careers that graduates enter, both within and outside academe. GPS aims to help students communicate effectively, plan and manage their time, be entrepreneurial, understand and apply ethical practices, and work effectively in teams and as leaders.

The Conflict Resolution Centre for Graduate Students offers support to the University of Toronto graduate community in taking steps to prevent or resolve conflict.

It is a peer-led services that welcomes graduate students to connect confidentially with one of our trained G2G Peer Advisors to talk about options and strategies for addressing a concern and available university supports and resources.

The Graduate Centre for Academic Communication (GCAC) provides graduate students with advanced training in academic writing and speaking. By emphasizing professional development rather than remediation, GCAC helps students cultivate the ability to diagnose and address the weaknesses in their oral and written work. GCAC offers four types of instruction designed to target the needs of both native and non-native speakers of English: non-credit courses, single-session workshops, individual writing consultations, and website resources.

Appendix E: Summary of selected Master's programs in environment and/or sustainability

University and Degree (and Format: Professional or Academic, Arts or Science)	Description	Length	Structure
UNIVERSITY OF TORONTO			
UTM Master of Science in Sustainability Management http://www.utm.utoronto.ca/mscsm/mscsm-program-overview Professional, Science	The MScSM program provides a strong foundation in sustainability management while offering an opportunity to specialize in a <i>management</i> or <i>science</i> concentration. The MScSM degree is for individuals who want to pursue management careers in sustainability-related divisions and organizations.	20 months	10 required core courses, 6 elective courses, major research paper and an internship placement of 2 to 4 months.
UTSC Master of Environmental Science http://utsc.utoronto.ca/gradpes/programs-menvsc-0 Professional, Science	Professional graduate programs for the training of practitioners of environmental sciences to meet today's needs of industry, government and NGOs. Three fields of study: Biophysical Interactions in Terrestrial and Aquatic Systems Conservation and Biodiversity Climate Change Impact Assessment	One year	Three options: Research Enrolment Option Internship Enrolment Option Part Time Enrolment Option
Dept of Geography http://geography.utoronto.ca/graduate-geography/programs-of-study/ Academic, MA in all fields of human geography, MSc in physical geography, spatial information systems and some areas of environmental studies	Students may undertake research in the following fields of specialization: Physical Geography and Natural Systems Environmental Geography and Resource Management Urban/Economic Geography Historical/Social/Cultural Geography Spatial Information Systems	One to two years	Two options: Thesis and Major Research Paper
ONTARIO			
University of Western Ontario Master's in Environment & Sustainability https://www.uwo.ca/enviro/graduate/mes_program/index.html Academic, Arts?	The Master's in Environment & Sustainability (MES) is an interdisciplinary program which uses project-based learning to enhance the graduate student's skill-set, in preparation for a career in the environmental field.	One year	Course-based with summer co-op term

<p>York University</p> <p>Master of Environmental Studies http://fes.yorku.ca/apply/mes/ Academic, Arts</p>	<p>The Master in Environmental Studies (MES) is self-directed and interdisciplinary. In place of a fixed set of curriculum offerings, the MES approach to learning supports students' ownership of and responsibility for their studies, fostering program coherence and depth through a plan of study.</p>	<p>Full-time, six-term, two-year</p>	<p>The Plan of Study is the foundation of the MES program. No predetermined field of study and only one required course. Series of exams. Four options for research work: major paper, major project, portfolio, or thesis</p>
<p>University of Waterloo</p> <p>Master of Environmental Studies (MES) in Social and Ecological Sustainability https://uwaterloo.ca/graduate-studies-academic-calendar/environment/school-environment-resources-and-sustainability/master-environmental-studies-mes-social-and-ecological-sustainability Academic, Arts</p>	<p>The ERS (Department of Environment and Resource Studies) programs are transdisciplinary, integrating perspectives and insights from the natural and social sciences and the humanities. Teaching and research emphasize three overlapping fields: Resource Analysis and Stewardship, Socio-Ecosystem Function and Renewal, Sustainability Policy and Governance</p>	<p>Thesis option: 5-6 terms Research Paper Option: 3-4 terms</p>	<p>Thesis Option and Major Research Paper Option</p>
<p>University of Waterloo</p> <p>Master of Environmental Studies (MES) in Sustainability Management https://uwaterloo.ca/graduate-studies-academic-calendar/environment/school-environment-enterprise-and-development-seed/master-environmental-studies-mes-sustainability-management Research-based, Arts?</p>	<p>The Sustainability Management graduate program is committed to providing future environmental leaders with the research skills, management tools, strategies and processes required to realize sustainable outcomes within business, government and third sector organizations.</p>	<p>3 to 6 terms (1-2 years). Part-time students must finish within 5 calendar years.</p>	<p>Thesis (100 pages)</p>
<p>Brock University</p> <p>Master of Sustainability https://brocku.ca/esrc/ssas/ Academic, Arts?</p>	<p>New in 2014, the graduate program in Sustainability Science and Society (SSAS) responds to environmentally related challenges and is aligned with the emerging transdisciplinary approach of sustainability science. Students can complete a Master of Sustainability in 16 months (Scheme A, classroom learning with practical experience),</p>	<p>Scheme A is 16 months Scheme B is 24 months</p>	<p>Co-op and Major Research Paper (Scheme A) or Thesis (Scheme B)</p>

	or 24 months (Scheme B, intensive research experience).		
Trent University MA in Sustainability Studies https://www.trentu.ca/sustainability/academic , Arts	This Program leads to a Master of Arts (M.A.) in Sustainability Studies and will carry out interdisciplinary graduate education and research that will improve our understanding of environmental sustainability, economic prosperity, and social responsibility.	Two years	Two options: Thesis and Major Research Paper
U of Ottawa MSc in Environmental Sustainability http://catalogue.uottawa.ca/en/graduate/master-science-environmental-sustainability/ Academic, Science	The interdisciplinary Master of Science (MSc) in Environmental Sustainability is aimed at providing future professionals and scholars with the skills and capacities needed to develop effective regulatory and policy solutions to today's complex, multi-dimensional environmental problems.	12 months for research paper 24 months for thesis	Two options: M.Sc. with thesis and the M.Sc. with research paper Co-op available: students must register full time and complete two work terms
Queen's University Master's of Environmental Studies http://www.queensu.ca/sgs/environmental-studies Academic, Arts	The MES program at Queen's University provides graduate level training in the field of Environmental Sustainability by practicing an interdisciplinary approach to the study of the long-term nature and impacts of environmental change, the connections between today's decisions and tomorrow's welfare, and the strong dependence of human well-being on environmental quality.	24 months for Research-based. 16-20 months for Course-based	Research-based Master's and Course-based
Nipissing University Master of Environmental Sciences/Studies http://www.nipissingu.ca/academics/graduate-studies/master-of-environmental/Pages/default.aspx Academic, Arts or Science	Nipissing University's new MES/MESc program offers students degrees in either Master of Environmental Studies or Master of Environmental Sciences. Both programs offer the training and development of graduates capable of contributing to the study of the environment and environmental issues and to the environmental problem solving of the future.	12 months for Major Research Paper 24 months for Thesis	Major Research Paper or Thesis options
CANADA			
Dalhousie University Master of Environmental Studies http://www.dal.ca/academics/programs/graduate/environmental-studies.html Academic, Arts	The MES program will give students the opportunity to create and share knowledge that will generate positive change in the world. They choose a pressing issue related to resources, environment or human wellbeing and the environment, and focus research and a thesis around their discoveries.	Two years	Both course work and a thesis

<p>University of Manitoba</p> <p>Master of Environment http://www.umanitoba.ca/faculties/environment/departments/geography/graduate/ma_environment/MEnv.html Academic, Arts?</p>	<p>The Master of Environment is an interdisciplinary program focusing on basic, and applied research. Dealing with, the complex relationships among the environment, earth, natural resources, and society at large. The program was created to facilitate research that incorporates or explicitly speaks to human beings as part of living landscapes. Participants have a wide range of backgrounds and generally incorporate at least two of the biological, physical, and social sciences in their research in remote, rural, or urban regions.</p>	Two years	6 credit hours from the 7000 level, including GEOG 7360 "environmental methodologies" course and 6 credit hours of any other course at the 3000-level or higher. A thesis is required.
<p>UBC</p> <p>Master's in Resource Management and Environmental Studies http://ires.ubc.ca/information-for-current-students/program-requirements/masters-program/ Academic, Arts or Science</p>	<p>The Master's degree provides candidates with the opportunity to broaden their academic and research experience. The student's background, the selection of the thesis topic, the approach to research, and the program electives, govern whether the Master of Art or Master of Science degree program is pursued. A research investigation producing a scholarly contribution to the particular area of study is necessary.</p>	Two years	A minimum of 36 credits, including a 12-credit thesis.
<p>University of Victoria</p> <p>MA and MSc in Environment Studies (political ecology, ecological restoration, and ethnoecology) http://web.uvic.ca/calendar2017-05/grad/programs/envi/program-requirements.html Academic, Arts and Science options</p>	<p>The School of Environmental Studies MSc, MA, and PhD (new for 2014) programs are research based and therefore all students are supervised by a faculty member along with an advisory committee. Three labs for graduate students: Ethnoecology, Restoration and Conservation Ecology, and Visualization.</p>	Two years	Thesis All students are required to attend a 3-day field camp at the beginning of their program as part of ES 500
<p>School of Environment and Sustainability, University of Saskatchewan</p> <p>Master of Environment and Sustainability (MES) https://grad.usask.ca/programs/environment-sustainability.php Academic</p>	<p>The MES is a thesis-based program that provides students with the opportunities and skills to advance their understanding of sustainability challenges in today's world. Education in complex problem-solving and the foundations of sustainability prepares students to play a significant role in knowledge generation, translation and decision-making. Students can explore the meaning of interdisciplinary research by considering a wide range of scientific, technical, political, social, economic and institutional factors that shape environmental</p>	Two years	Thesis Two required courses, two core courses, two elective courses, seminar series in Environment and Sustainability, and continuous registration in the thesis research course.

	and sustainability problems, their management and their potential solution.		
Concordia University MSc in Geography, Urban and Environmental Studies https://www.concordia.ca/academics/graduate/geography-urban-environmental-msc.html Academic, Science	The MSc in Geography, Urban and Environmental Studies provides students with the theoretical foundation and analytical tools they need to better understand human interventions in the environment. Students are encouraged to explore multidisciplinary perspectives. Students examine and apply various conceptual and methodological frameworks that fall within three broad environmental categories: Natural or bio-physical environment Human, cultural or behavioural environment Urban, built or designed environment	One year	Thesis All students must take the following: 9 credits in 3 core courses, 6 credits in 2 elective courses, 30 credits for thesis.
INTERNATIONAL			
School of Sustainability, Arizona State University https://schoolofsustainability.asu.edu/ MA, MSc, Master of Sustainability Solutions Academic	The MA and MSc in Sustainability are research-oriented degrees that culminate with either a thesis or a capstone in the form of a publishable, scientific paper. The Master of Sustainability Solutions (MSUS) is designed to prepare students to apply sustainability principles and approaches to careers in a variety of fields. A distinguishing element of the MSUS (vs. the MA or MSc) program is the capstone experience, in which students will do an internship, applied project or workshop (in lieu of a thesis) that emphasizes the application of sustainability principles and approaches to their chosen career field. Students team up with a company, a government agency, or an NGO to develop a real-world sustainability solution.	Two years	37 semester hours (MA, MSc) 33 semester hours (MSUS)
University of Pennsylvania Master of Environmental Studies degree with a concentration in Environmental Sustainability http://www.sas.upenn.edu/lps/graduate/mes/curriculum/environmental-sustainability Academic, Arts	The Master of Environmental Studies program provides an innovative, interdisciplinary approach to the study of the environment. The Master of Environmental Studies degree offers a concentration in Environmental Sustainability.	Two years	Required capstone project: varies widely, from research papers to videos, business plans, photojournals and websites.
Bren School of Environmental Science & Management,	The Master of Environmental Science and Management (MESM) program is a	Two years	Courses and Master's Project, which serves as

<p>University of California, Santa Barbara</p> <p>Master of Environmental Science and Management http://www.bren.ucsb.edu/academics/mesm.html Professional, Science</p>	<p>professional degree program designed for individuals who plan to enter or re-enter the workforce upon graduation. The program focuses on application and problem-solving and has three parts: the first-year core curriculum, the second-year work in one of seven Specializations, and the Group Project or Eco-Entrepreneurship Project.</p>		<p>the thesis and can be either a Group Project or an Eco-Entrepreneurship Project.</p>
<p>Nicholas School of the Environment, Duke University, Master of Environmental Management</p> <p>https://nicholas.duke.edu/ https://nicholas.duke.edu/programs/masters Academic/Professional, Natural and Social Sciences</p>	<p>The Master of Environmental Management (MEM) degree, with its emphasis on natural and social sciences, trains students to understand the scientific basis of environmental problems, as well as the social, political, and economic factors that influence policy solutions. Students design an individualized program to prepare them for leadership in the corporate, nonprofit, government or academic sector. Students can also earn a professional MEM or MF degree concurrently with a master's degree in business, law, public policy, engineering or education.</p>	Two years	<p>MEM students choose one of seven specialized concentrations as a focal point for their studies. The MEM involves coursework and a Master's Project. An online version is offered to environmental professionals with at least 5 years of experience.</p>
<p>School of Natural Resources and Environment, University of Michigan</p> <p>Master of Science in Natural Resources and Environment - Sustainable Systems field https://seas.umich.edu/academic/ms/ss Academic, Science</p>	<p>The Sustainable Systems field of study offers an interdisciplinary curriculum focused on enabling technology and enterprise to enhance the sustainability of systems that provide mobility, shelter, sustenance, communication and recreation.</p>	Two years	<p>Required capstone/opus – can be a group project, practicum, or thesis</p>
<p>School of Forestry & Environmental Studies, Yale University</p> <p>Five Master's degrees http://environment.yale.edu/ Professional (MEM, MF) and Academic (MS, MESC)</p>	<p>At the Master's level, FES offers five options: environmental management (MEM), forestry (MF), forest science (MFS), environmental science (MESC), and a one-year mid-career master's degree. There is also a five-year program for Yale undergraduates where their undergraduate degree is rolled in with a master's. FES also offers a number of joint master's degrees (management/school of business, divinity, law, public health, etc).</p>	Two years for the four main programs (MEM, MF, MFS, MESC).	<p>The MEM and MF students have a capstone course or project, and generally spend their summers in internships. MFS and MESC students have a thesis, and generally spend their summers conducting research for their thesis.</p>
<p>School of International and Public Affairs, Columbia University Master of Public Administration</p>	<p>The MPA-ESP provides a management and policy analytic core and a natural and social science earth systems concentration. The intensive course of study begins in early June.</p>	One year	<p>Students complete a total of 54 points over three semesters. Some courses involve</p>

<p>in Environmental Science and Policy</p> <p>http://bulletin.columbia.edu/sipa/programs/esp/</p> <p>Academic, Public Administration</p>	<p>The summer term features the fundamental science of earth systems and conservation biology, as well as an introduction to environmental policy and management issues. In the fall and spring, students delve deeper into the formulation and management of public policy. The physical and social sciences are linked throughout the program so that students gain an integrated understanding of earth systems.</p>		<p>workshops with small group project.</p>
<p>University of Colorado, Boulder Master of the Environment (MENV)</p> <p>http://www.colorado.edu/menv/Professional</p>	<p>The MENV is a professional master's degree program that is administered by the Environmental Studies Program, but partners with units and disciplines across the Boulder campus including the Environmental Design Program, Colorado Law, the Leeds School of Business, and the Department of Economics, and organizations and institutions in the community.</p>	<p>17 months</p>	<p>The program is designed for professionals and has four primary curricular components: (1) the core curriculum, (2) a choice of topical specializations that are supported by (3) electives, and (4) a Capstone Project.</p>
<p>University of Colorado, Boulder Master of Science</p> <p>http://www.colorado.edu/envs/graduate-students/ms-phd-programs/masters-degree</p> <p>Academic, Science</p>	<p>The ENVS Master of Science degree is a research-based graduate program that allows students to conduct research and coursework in a range of areas important for the environment and sustainability. For most students, the heart of the MS program is completion of a master's thesis.</p>	<p>20 months</p>	<p>36 course credit hours as follows: a common core consisting of two broad introductory three-credit courses, and two semesters of ENVS Colloquium (2 course credits) For most students, the final requirement is a thesis worth 6 of the 36 credit hours required for the MS degree. All ENVS graduate students are encouraged to include a 2-credit internship as part of their degree plan, even if doing a thesis.</p>
<p>University of London (Birkbeck) MSc Environment and Sustainability</p> <p>http://www.bbk.ac.uk/study/2015/postgraduate/programmes/TMSENSUS_C/</p>	<p>This MSc in Environment and Sustainability aims to provide an advanced-level grounding in sustainable responses to a broad range of environmental issues. As the programme is offered through part-time, evening, face-to-face study, it provides a distinctive opportunity for practitioners to combine</p>	<p>2 years part-time or 1 year full-time</p>	<p>Six taught modules and dissertation</p>

Professional, Science	study with a continuing career. Completion of this MSc will allow students to become an Associate Member of the Institute of Environmental Management and Assessment (IEMA).		
University of Edinburgh MSc in Environmental Sustainability http://www.ed.ac.uk/schools-departments/geosciences/postgraduate/masters-programme/taught-masters/msc-environmental-sustainability/msc-environmental-sustainability Academic? Science	The MSc in Environmental Sustainability explores questions such as: How can we improve the situation of the world's poor without threatening the ecological processes that support human well-being? How should we restructure our economy and energy systems to combat climate change? What policies foster sustainability? How can the transition to more sustainable lifestyles be encouraged?	One year	Taught courses (September to April) and dissertation project work (May to August)
Kiel University MSc in "Sustainability, Society and the Environment" http://www.sustainability.uni-kiel.de/en/taught-masters/master-of-science-sustainability-society-and-the-environment-1 Academic, Science	The MSc in "Sustainability, Society and the Environment" (SSE) and the MSc in "Environmental Management" (EM) form the core of the School of Sustainability at Kiel University. While the master's programme in "Environmental Management" focuses on ecology and environmental management, the master's programme in "Sustainability, Society and the Environment" analyzes society's sustainable development issues and aims to empower students to develop strategies for a sustainable future.	Two years	Courses and Master Project in second summer
Stockholm University Master's Programme Social-Ecological Resilience for Sustainable Development http://sisu.it.su.se/search/info/NSRHO/en Academic?	The Master's Programme in Social-Ecological Resilience for Sustainable Development aims to enhance students' knowledge of the complex interactions between social and ecological dynamics at different scales; particularly ecosystem management and governance in the context of change and uncertainty. Students are introduced to different research approaches and methods for studying coupled social and ecological systems.	Two years : one year of courses and including option of traineeship, and one year on thesis	Course and degree project
University of Utrecht Master's in Sustainable Development http://www.uu.nl/masters/en/sustainable-development Professional, Science	This two-year Master's in Sustainable Development is aimed at students who want to contribute to the development of sustainable environmental solutions. It also focuses on the changes needed to achieve an environmentally and socially accountable society.	30 months	Courses and thesis

	Four Tracks: Energy and Materials Global Change and Ecosystems Environmental Governance International Development		
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Appendix F: External Appraisal Report

New Program Proposal

Appraisal Report

*The following report reflects the program review conducted on the 21st of October, 2019 by Professors Terre Satterfield and Thomas Dietz, on behalf of the University of Toronto's School of the Environment. We have based the assessment below on the evaluation criteria provided, using information provided, and conversations held during our visit with academic, administrative and student parties. Overall, it is our assessment that this is a very well-designed program, with several innovative dimensions. It is well thought out, well presented and has been through multiple rounds of extensive consultation with all commensurate programs across the University of Toronto campuses. It clearly matches an important societal need and we expect there to be substantial student demand for the program. Indeed, having conducted several reviews of this kind, we can comfortably state that the program -- as described in the documents provided and as apparent across conversations on campus -- is **the best example of a proposal for a new program that either of us have encountered**. We believe the program will be highly successful and will be a strong element in the University's mandate for excellence in this realm.*

Report Summary

Program Evaluation Criteria

1 Objectives

Consistency of the program with the institution's mission and unit's academic plans.

Clarity and appropriateness of the program's requirements and associated learning outcomes in addressing the academic division's graduate Degree-Level Expectations.

Appropriateness of the degree or diploma nomenclature.

The MES program is clear in its design and that design is strongly aligned with the School's mission. The program is clear and coherent and well matched to societal needs, faculty strengths and student demand. The four Concentrations are appropriate given the School's and the University's strengths. They match student interests and will serve as "connectors" between faculty with appointments in the School and other University faculty. The Concentration structure also allows great flexibility to allow the MES to evolve over time as needs and resources change. We also feel that the research focus of the degree is an appropriate complement to other

programs at the University. Our conversations made it clear that the School's faculty are thinking carefully and creatively about how to make the thesis an effective yet efficient learning tool.

The MES is also a logical and indeed essential step forward in the School's plans. Indeed, it is somewhat surprising that a program such as this does not already exist at the University of Toronto given the quality and reputation of the faculty, the strength and size of commensurate undergraduate programs and the interest expressed by undergraduates. Clearly, the time is right for the University to offer a strong interdisciplinary, research focused program in the environment and sustainability. The proposed degree will realize that opportunity.

The MES as proposed is also a solid program that meets or exceeds the rigour of comparable degrees at other institutions. The mixture of required courses and the research focus differentiate it from and provides a complement to other disciplinary or interdisciplinary programs offered across the UofT campuses. The program's mandate as both an interdisciplinary and transdisciplinary degree opportunity is clearly and robustly defended in the 'academic rationale' section of the proposal. Further, the proposed Concentrations – social sustainability, adaptation and resilience, the sustainability transition, and global change science are unique, well described, and non-competitive with University of Toronto's other environmental programs (e.g., the Environmental Science and Sustainability Management programs at UTSC and UTM respectively). We are impressed by the care the development team for the MES has taken, in the form of extensive consultation with other units, to ensure that all cognate units understand the MES role. The relationships being developed will also optimize the capacity for the program and the School of Environment to become a hub program and bridging entity across campuses.

2 Admission Requirements

Appropriateness of the program's admission requirements for the learning outcomes established for completion of the program.

Appropriateness of any alternative requirements for admission into the program such as minimum grade point average or additional languages or portfolios, along with how the program recognizes prior work or learning experience.

The program will abide by the already high standard for graduate admission at UofT, and of course the overall strength of UofT is a major asset for the program. We have given careful thought to the requirement that incoming students already have at least a minor that is interdisciplinary. We endorse this requirement as reflecting the current body of students most interested in the degree and the need in a focused program to have students enter the program ready to do interdisciplinary and transdisciplinary work. The plan is for a relatively small (n=10-15) initial cohort, increasing to a steady state of ~ 30. This seems an appropriate strategy for

“ramping up” the program and learning from initial experiences. Beyond this, there exists a well thought out plan to match every incoming student with a faculty advisor. Commitment of faculty to student supervision has been vetted and all graduate faculty represented in the plan have expressed interest in the program and in student supervision. Since students will also be recruited from commensurate undergraduate programs in environmental studies or sciences, or from disciplinary programs that included an interdisciplinary environment minor, or from programs such as physical and human geography or environment and sustainability more broadly, they should be able to make rapid progress compared to students with only disciplinary backgrounds. The required letter of intent from students will also be a significant screening tool, ensuring that each cohort is composed of students with research goals appropriate to the program and its faculty resources.

3 Structure

Appropriateness of the program's structure and regulations to meet specified program learning outcomes and Degree-Level Expectations.

Rationale for program length in order to ensure that the program requirements can be reasonably completed within the proposed time period.

The extent to which the program structure and delivery methods reflect universal design principles and/or how the potential need to provide mental or physical health accommodations has been considered in the development of this program.

The proposed program is a one year or “12 month” degree is intense but the structure of the program is well planned to support student progress. The core course work in the first semester, including a core research design that will lead to a proposal as well as designation of a thesis committee of three faculty. Together these insure that by the end of that term students will be well along in developing their research projects. The winter term will enable thereafter the necessary suite of electives to enhance on time completion of their programs. The summer semester will be dedicated to students’ thesis projects and writing, with an end of summer presentation in a colloquium setting. It is clear that the faculty are thinking realistically about the thesis requirement so that projects will be appropriate for the length of the degree. For example, our discussions included faculty acknowledging that some research topics that might require fieldwork would not be feasible. Initially advisors will be assigned from the core faculty, which is sufficiently strong and varied to meet this need. Future hiring in the School of the Environment of tenure-stream assistant professors will provide the opportunity for further refinement of the program and to link student and faculty interests. The flexibility of the four Concentrations also provides for easy student navigation.

The only challenge to completing the degree in the 12-months planned is, likely, student perceptions regarding the thesis. The faculty are very attentive to this issue. For example, we discussed with faculty several models for the thesis, including the 'one publishable' paper possibility or a more traditional thesis confined to a 50-60 page range. Additional models discussed included the 'adding one of our students to a research group' model, wherein faculty linked to the MES program propose a piece of research for enrolled students. This model has already been successful with graduate minors. And, overall, the program is designed to move students along efficiently. The content and structure of the core coursework also will facilitate on time completion of the thesis. The proposed end of program symposium provides a way for efficient handling of the thesis defense as well as improving student communication skills. Ideally, this symposium might be attended by all incoming and outgoing students each year to help orient incoming students to thesis expectations and build cross-cohort networks. The proposed program also has in place a one-term extension, should they find this needed by some students.

As noted above, the small initial cohorts will allow tailoring of thesis expectations and process based on experience. This is of course common to all academic programs. The diversity of thesis expectations across campus provides many models for effective approaches.

4 Program Content

Ways in which the curriculum address the current state of the discipline or area of study.

Identification of any identified unique curriculum or program innovations or creative components and their appropriateness.

For research-focused graduate programs: clarity of the nature and suitability of the major research requirements for degree completion.

Evidence that each graduate student in the program is required to take all of the course requirements from among graduate-level courses.

The requirements for degree are clearly articulated in the proposal as are the set of courses available for electives (half the required coursework), with several options for each of the four concentrations or streams. This allows high substitutability of courses in years where some elective courses are not available. We see no problem in delivery of courses; we discussed this issue with a number of faculty to examine capacity in existing courses to support additional students from the MES. The lone exception was a course in systems thinking, one of 19 possible electives in the "Adaptation and Resilience" concentration. In addition, the "University of Toronto Campus as a Living Lab of Sustainability" core course may eventually need to be offered more often than at present, but that seems quite manageable. Since the remaining courses will be

offered by rotating members of the core faculty team, there should be considerable flexibility to handle semester by semester changes in demand and faculty availability.

5 Mode of Delivery

Appropriateness of the proposed mode(s) of delivery (distance learning, compressed part-time, online, mixed-mode or non-standard forms of delivery, flexible-time options) to meet the intended program learning outcomes and Degree-Level Expectations.

The face-to-face in-classroom mode of delivery for the coursework is highly appropriate for the MES. In interdisciplinary programs, a great deal of learning comes from students with somewhat different backgrounds interacting with each other and developing effective language and skills for interdisciplinary communication. The core courses and end of year colloquium will build cohorts among the students in the MES. The elective courses, most of which will be face-to-face in-classroom, will broaden the student experience. The thesis option provides the complement to the coursework by having the students work closely with individual thesis advisors and thesis committees on an extended project. We have noted that the thesis workload is substantial but our discussions and the program proposal make clear that the process for the thesis is well crafted to ensure timely progress and successful student research without overburdening the faculty. No part-time option will be offered, as is appropriate for an intensive learning environment such as this.

6 Assessment of Teaching and Learning

Appropriateness of the proposed methods for the assessment of student achievement of the intended program learning outcomes and Degree-Level Expectations.

Completeness of plans for documenting and demonstrating the level of performance of students, consistent with the academic division's statement of its Degree-Level Expectations.

The program's mandate for teaching and learning is fully articulated on pages 24-33 of the proposal, all of which meet or exceed the expectations of the university and the province of Ontario. Learning objectives are both robust and unique. Students will understand how data and methods are used to create and interpret knowledge around issues of environmental and social sustainability. Their thesis research will be problem focused – matching an interest strongly expressed among undergraduate students we interviewed. Through the coursework students will develop the capacity to design, evaluate, and test the tools needed for transitions to sustainability, different climate futures, or the realization of social and physical sustainability through different governance systems. And both normal coursework assessments and especially the thesis project will provide 'hands on' supervision of student, which helps guarantee the

quality of student learning overall. Given the success of the School's undergraduate program and the care and thought that has gone into this proposal, we anticipate a strong and effective learning environment.

7 Resources

Adequacy of the administrative unit's planned utilization of existing human, physical financial resources, and any institutional commitment to supplement those resources to support the program.

Participation of a sufficient number and quality of faculty who are competent to teach and/or supervise in the program.

Adequacy of resources to sustain the quality of scholarship and research activities of graduate students, including library support, information technology support and laboratory access.

Faculty have recent research or professional/clinical expertise needed to sustain the program, promote innovation and foster an appropriate intellectual climate.

Where appropriate to the program, financial assistance for students will be sufficient to ensure adequate quality and numbers of students.

Supervisory load distribution and the qualifications and appointment status of faculty who will provide instruction and supervision.

We toured the space for the program, which is sufficient and will improve once planned renovations are complete. Should the School develop a PhD program, which is a logical extension of the MES and fully warranted, further space will be required. The biggest resource barriers are the inability for the School to hold grants and be the tenure home for faculty, and the question of funding for students in the MES program in the long term. We will address each.

If the School moves to EDU-A status, then grants held by faculty in the School may be used to help support students. In general, this change in status, which as we understand it will also allow tenure stream appointments within the School, will be essential for long term success of all the School's programs, including the MES. Without this, there will be an inevitable tendency to default to disciplinary rather than interdisciplinary hires and difficulty in focusing faculty effort on the interdisciplinary programs. Nearly all the Canadian, US, and European programs presented for comparison in the proposal have both faculty with tenure homes in an interdisciplinary unit and faculty in disciplinary units who are affiliated with the interdisciplinary unit. New cohorts of faculty and students actively seek these interdisciplinary affiliations. UofT will eventually be at a disadvantage without this change in status for the School. We do note that we see no problems with the first few cohorts of students in the MES succeeding under the current structure—it is the long term that requires a stronger commitment to interdisciplinarity.

Funding student programs of study may also be a problem for the long term. From our conversations we understood that there are clear commitments to provide reasonable support for all students in the first few cohorts via scholarships and through the large number of TA's needed to support existing (and growing) undergraduate course enrollments. Thus, the MES program expects to provide funding packages that are within a few thousand dollars of funded programs for the initial cohorts. As the program demonstrates success, the competitiveness of student funding should be revisited.

Finally, we note a small issue that will have to be addressed as the MES matures. There was enthusiasm for affiliated faculty moving a substantial fraction of their appointments to the School for one-to-three-year engagements. This has many advantages. But it has to be done in a way that ensures financial arrangements (e.g., in the form of teach buy outs) are fair to the home department.

8 Quality and Other Indicators

Quality of the faculty (e.g., qualifications, research, innovation and scholarly record; appropriateness of collective faculty expertise to contribute substantively to the proposed program).

Program structure and faculty research that will ensure the intellectual quality of the student experience.

The extent to which the program has integrated any elements that enhance the diversity of its curriculum, students or teaching staff.

The quality of the new courses proposed, the array of existing courses that can support the program, the clear plan for mentoring students through the thesis and the care taken to develop strong collaborative relationships with related programs make us confident the program will be highly successful. But of all of this is of course built on the strength of the faculty engaged. We fully concur with the analyses offered in the supporting material: UofT is among the strongest universities in the world in environment. And since programmatic development until now has been minimal, this ranking is based largely on the strength of the faculty.

We note that among faculty with whom we spoke, the absence of a research-based graduate program such as this is an impediment to their work and professional development. This matches a pattern we have observed in other reviews at peer institutions. Newer cohorts of students and of faculty view engagement in interdisciplinary programs as essential to their professional development. Indeed, the lack of such a program can be an obstacle to recruiting top talent, and in some cases a lack of support for such programs can lead to loss of the very best early to mid-career faculty. Thus not only does the quality of the faculty justify the program the program may be crucial for attracting and retaining top faculty.

Appendix G: Dean's Administrative Response to the External Appraisal Report



November 12, 2019

Professor Susan McCahan
Vice-Provost, Academic Programs
Office of the Vice-President and Provost
University of Toronto

RE: Administrative Response to the External Appraisal of the Proposed Master of Environment and Sustainability (MES)

Dear Professor McCahan,

I was very pleased to receive such a positive and enthusiastic appraisal of the proposed Master of Environment and Sustainability (MES) program, to be offered through the School of the Environment. I would like to thank Professors Terre Satterfield and Thomas Dietz for their time, and for their careful, thorough assessment of the program. On behalf of the Faculty and the School of the Environment, I appreciate their dedication to this process, and am grateful for their thoughtful feedback.

In preparing this response, my office requested an administrative response to the appraisal from Professor Steve Easterbrook, Director of the School of the Environment, lead proponent of the new program. Professor Easterbrook's letter to me, dated November 6, 2019, outlined the appraisers' recommendations and potential responses, in which I am in agreement. The following draws upon the program's response:

The appraisers state that the MES is a "very well-designed program, with several innovative dimensions," and that it meets an important societal need. "The time is right," they declare, for the University of Toronto to offer an interdisciplinary, research-focused program in this area. The appraisers were impressed by the differentiation between this program and other environment-focused programs across the University, and the level of consultation that has taken place in the spirit of developing collaborative relationships and emphasizing the complementarity of the University's degree offerings in this area. They commended the program's learning objectives as "robust and unique," and felt that its structure, with four thematic concentrations, reflects faculty strengths and provides flexibility for the program to evolve over time.

The interdisciplinary focus of the MES is a key strength; the appraisers note that students and faculty alike are keen to engage in this type of scholarship. The admission requirement that prospective students have some interdisciplinary background was endorsed as a means of ensuring appropriate preparation for an intensive, research-focused program. The appraisers commended the program structure and saw great complementarity between the coursework and the thesis. They observe that the program has a substantial workload, but they note that the School has put careful thought into the program design, including how to make the thesis an "effective yet efficient learning tool," and they express full confidence that the program structure will successfully support timely student progress. In particular, the core course work requires students to begin thinking about and developing their thesis proposal at an early stage, and the formation of a thesis committee by the end of the fall term (with the supervisor assigned upon admission) ensures that students will be appropriately mentored throughout their thesis work. It is worth noting that the undergraduate students the appraisers met with expressed excitement about conducting problem-focused thesis research, affirming the thesis as a valuable element of the program. We appreciate, though, that it will be important to monitor student progress,

OFFICE OF THE DEAN

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and we agree with the appraisers' suggestion to orient incoming students to thesis expectations by inviting them to the August MES research symposium, at which outgoing students present their thesis research.

The appraisers felt that program's course offerings are high-quality and varied, with plentiful options for each of the four concentrations. They correctly note that existing courses have the capacity to support additional students from the MES with the possible exception of a course in systems thinking, which the School will monitor as the program grows. As well, they note that additional sections of the core course "The U of T Campus as a Living Lab of Sustainability" may be needed as the program grows. The School of the Environment has the faculty resources to offer additional capacity in these two courses (and others) as student demand requires, and is certainly prepared and equipped to offer additional course sections as necessary.

The appraisers also commented on resource barriers that may confront the program in the longer term. First was the need for additional space should the School develop a PhD program at a future point in time. The School has a well-defined, two-phase space plan which anticipates the needs of the MES as well as possible future growth. The current space plan involves a renovation of the School's existing space, to be completed in the summer of 2020, to accommodate the MES program's first several cohorts and possibly, initial PhD cohorts. The second phase of the plan involves the School's move, within five years, into its own building on the St. George campus. This move will approximately triple the amount of space currently occupied by the School.

A more significant issue, the appraisers note, and that I have discussed at length with Professor Easterbrook as flagged in his administrative response, is the School's current status as an EDU:B (Extra-Departmental Unit). An EDU:B may only hold minority budgetary appointments, which means it is unable to be the tenure home for faculty. The appraisers suggest that a change to EDU:A status is essential to the long-term success of the School's programs. This change would allow the School to direct faculty grants towards student support, and, by enabling the School to hold majority budgetary appointments [or 100%] tenure-stream appointments, would permit more flexibility in pursuing future interdisciplinary hires. I agree this question must be resolved, and I will be striking a working group to explore the possibility of the School becoming an EDU:A. The viability of the MES, however, is independent of the School's EDU status. The School, even as an EDU:B, is able to draw on faculty grants and has plentiful and diverse faculty resources, including cross-appointed and seconded tenure-stream faculty across multiple departments, majority teaching-stream faculty, and research-active CLTA faculty. The School also enjoys the active engagement of its affiliated faculty. The appraisers emphasize the quality and the strength of the School's faculty, and the supervisory capacity for the program has been vetted and well-planned. It is important to reiterate that while the appraisers view the move to an EDU:A as advantageous in the long-term, the current structure of the School will not negatively impact the success of the program or its students. In fact, as the appraisers make clear, the program as currently positioned is equipped to thrive.

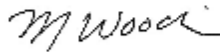
The appraisers also flagged the issue of possible secondments of affiliated faculty to the School for one to three-year periods, and the need to appropriately compensate home departments in these arrangements. We fully agree that faculty secondments should be negotiated fairly. This issue will be addressed by the above-mentioned working group; at the same time, it does not have an immediate bearing on the viability of the MES.

Finally, student funding is another issue touched upon by the appraisers. While the School has committed to providing MES students with financial support through teaching and research assistantships and scholarship support, the appraisers suggest that as the program demonstrates success, the level of funding provided to students should be revisited. Financial support for graduate students is a key priority of the Faculty and we are committed to working with the School to ensure consistent

and competitive funding for MES students. The program's student funding will evolve as the program evolves.

I would like to again express my thanks to the appraisers for their wholehearted support of the MES program. They strongly assert that the program is necessary and important, and that the University, and the School of the Environment in particular, is well-placed to offer it. "U of T is among the strongest universities in the world in environment," they declare, elsewhere commenting that "[i]ndeed, it is somewhat surprising that a program such as this does not already exist at the University of Toronto given the quality and reputation of the faculty, the strength and size of commensurate undergraduate programs and the interest expressed by undergraduates." We are heartened by this tremendous recognition of our excellence in this area, and we are encouraged by the appraisers' confidence that the program will be a success. It has been a pleasure to respond to their thoughtful and helpful comments, and we are excited to move forward in offering this innovative program to our students.

Sincerely,



Melanie Woodin
Dean, Faculty of Arts & Science
Professor, Cell & Systems Biology

cc: Professor Steve Easterbrook, Director, School of the Environment

Appendix H: Vice-Provost's Response to the Dean's Response



OFFICE OF THE VICE-PROVOST,
ACADEMIC PROGRAMS

December 4, 2019

Melanie Woodin
Dean, Faculty of Arts & Science
University of Toronto

Re: Appraisal Report, Proposed New Master of Environment and Sustainability (MES)

Dear Melanie,

I am very pleased to receive the appraisal of the proposed Master of Environment and Sustainability. Your administrative response to the appraisal nicely summarizes the report and highlights the specific suggestions made by the appraisers for consideration.

The appraisers commented on the importance of monitoring student progress in the one-year master's and suggested inviting incoming students to the August MES research symposium, at which outgoing students present their thesis research. The appraisers also recommended that the School monitor the course on systems thinking for capacity, and suggested that additional sections of the core course, The U of T Campus as a Living Lab of Sustainability, may be needed as the program grows. You agree with these suggestions and confirm that the School will monitor course capacity.

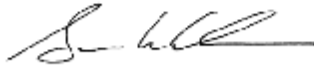
The appraisers suggested that additional space would be needed if a PhD program in the area was developed. Your response confirms that the renovation of the School's existing space, which will be completed before the program launches, will accommodate the new program and there are plans in the future to expand the School's space within five years.

You agree with the appraisers that as the degree program evolves, the competitiveness of student funding should be revisited, and you note that financial support for graduate students is a key priority of the Faculty.

The appraisers recommended that the School of the Environment's Extra-Departmental Unit (EDU) status change from an EDU:B to an EDU:A in order to support long-term success of the School's programs, as this would allow for the School to hold majority appointments of tenured and tenure-stream faculty. Your letter points out that, regardless of its EDU status, the School has diverse faculty resources and can draw on faculty grants; nevertheless, you will strike a working group to explore the possibility of the School becoming an EDU:A. The working group will also explore the appraisers' recommendation that there be secondments of affiliated faculty to the School for one- to three-year periods, with provisions to appropriately compensate home departments.

I will be very pleased to recommend this new graduate degree program to governance for approval, following approval at the Divisional level.

Sincerely,



**Susan McCahan
Vice-Provost, Academic Programs**

cc:

**Joshua Barker, Dean of Graduate Studies and Vice-Provost, Graduate and Research Education
Gretchen Kerr, Vice-Dean, Programs and Innovation, School of Graduate Studies
Brian Desrosiers-Tam, Director, Office of the Vice-Provost, Graduate Research and Education
Daniella Mallinck, Director, Academic Programs, Planning and Quality Assurance, Office of the Vice-Provost, Academic Programs
Jennifer Francisco, Coordinator, Academic Change, Office of the Vice-Provost, Academic Programs**