

MEMO

ATTENTION: Senate

FROM: Jonathan Driver, Vice-President, Academic & Provost

RE: Environment Faculty

DATE: November 18, 2008

At its meeting today, the Senate Committee on Agenda and Rules agreed on wording for the motion to be presented to Senate at its meeting on 1 December 2008:

MOTION

That Senate accepts that the proposed programming for the Environment Faculty satisfies the condition of the motion approved by Senate on 7 April 2008, ~~that established that Faculty.~~

*including a strong commitment
for new program development
at both the undergraduate and
graduate level*

SIMON FRASER UNIVERSITY
Senate Committee on University Priorities
Memorandum

TO: Senate

FROM: Jonathan Driver
Chair, SCUP
Vice President, Academic

RE: Report from the Faculty of
Environment Interdisciplinary
Programming Committee (SCUP 08-32)

DATE: November 10, 2008

Subsequent to the extensive work and recommendations of the Phase 2 Task Force on Academic Structure, at its meeting of April 7, 2008 Senate provisionally approved the establishment of a Faculty of Environment. Final approval is contingent upon further approval by Senate of potential new programming in a new Faculty¹. The Faculty of Environment Interdisciplinary Programming Committee was established and mandated to demonstrate both the capacity and potential for significant new programming under an Environment Faculty, as described in the attached final report from the committee. The committee report (submitted to the Vice President Academic) was reviewed and discussed at SCUP, resulting in the following motions:

Motion 1

That SCUP endorses and recommends to Senate the recommendation of the Faculty of Environment Interdisciplinary Programming Committee that a new Environment Faculty be formed, and advises Senate that there is potential to develop the Faculty around existing and complementary new programming.

Motion 2

That SCUP reconfirms to Senate that the Environment Faculty have administrative responsibility for the following: the Environmental Science Program; the Department of Geography; the School of Resource and Environmental Management; the Centre for Sustainable Community Development; and the Graduate Certificate in Development Studies.

Rationale and Background

The Faculty of Environment Interdisciplinary Programming Committee was established and mandated as described in the attached final report from the committee. The committee completed its work and has detailed the capacity and potential for important new programming under an Environment Faculty.

¹ The term "Environment Faculty" is a neutral placeholder for the final name of the Faculty, to be determined at a later date.

The details provided in the report demonstrate that SFU currently benefits from a significant depth and breadth of resources and expertise in environmental teaching and research, and that the development of new programs is feasible. The report of the FEIPC has received the support of the proposed founding units of the new Faculty, and the faculty members have reaffirmed their desire to see the new Faculty created, by votes taken in those founding units.

As was previously discussed at Senate in April 2008, and as the report of the FEIPC reconfirms, SFU is well positioned to provide a contribution to the global environmental challenge through the creation of an Environment Faculty. The vision of potential new programming for the Faculty is disciplinary and interdisciplinary. Building on the substantial platform provided by existing curriculum and degree programs in Geography, Environmental Science, and Resource and Environmental Management, the potential of the new programming described in the FEIPC report will facilitate the further growth and development of new graduate and undergraduate degree programs, provide coherence and vision to teaching and research in this area, and will significantly raise the profile of environmental research and education at SFU.

The proposals in the FEIPC report should be considered as an indicator of the directions that new and existing interdisciplinary programming in the Faculty might take. The report is about potential and proposed directions. Specific details of any programmatic themes and potential curriculum described in the report would be developed according to the University's normal curriculum and program development processes, once the establishment of the Faculty receives full and final approval from Senate. In addition, in order to give further reassurance that the potential discussed can be realized, and further to the FEIPC report, a small working group consisting of representatives from Environmental Science, Geography and REM have worked together to create a development timeline of the next steps required to focus and implement the FEIPC recommendations. This document is attached, and in particular indicates the processes that would be utilized to determine the following:

- *Approval of programming*
- *Administrative structure and governance*
- *Naming the Faculty*

The opportunity exists for SFU to become a leader in environmental programming through the creation of the Environment Faculty that will focus internal and external attention on our strengths in this field. The window exists for SFU to promote and consolidate existing programming, as well as to expand into a solution-oriented and integrated programming approach that will establish SFU's niche in the area of post-secondary environmental education and research. SFU has a history of community outreach blended with its academic programs. Public and political interests in pressing environmental challenges have created synergy with the expertise that exists at SFU, and that synergy should be capitalized upon. SFU has a strong base of interdisciplinarity in teaching and research and interdisciplinarity is now an identified priority in public and private funding initiatives. Approving a new Environment Faculty will enable these initiatives to forge ahead while the energy and opportunity are high.

Attachments:

- i) Faculty of Environment Interdisciplinary Programming Committee Report (SCUP 08-32)
- ii) FE/FES Blueprint and Development Timeline
- iii) Letter to Senate from School of Resource and Environmental Management

cc. Faculty of Environment Interdisciplinary Programming Committee:

J. Clague, L. Bendell, A. Clapp, K. Kohfeld, D. Allen, R. Anderson, M. Roseland, M. Howlett, M. Gates, B. Wepruk

Blueprint and Development Timeline Working Group:

R. Hayter, L. Bendell, P. Williams, D. Knowler

	January 09	February 09	March 09	April 09 New Faculty comes into being	Summer Semester 09	Fall Semester 09	Spring Semester 10	Summer Semester 10	Fall Semester 11	Spring Semester 11	Summer Semester 11	Fall Semester 12	Spring Semester 12	Summer Semester 12	Fall Semester 12
Transition of Existing Units															
<i>Transition for FE/FES will occur the same as in other Faculties being restructured.</i>															
•REM and all existing ^{a)} programs, faculty, staff, students, budgets, space, governance structure and equipment officially become part of FE/FES				X											
•GEOG and all existing ^{a)} programs, faculty, staff, students, budgets, space, governance structure and equipment officially become part of FE/FES				X											
•EVSC and all existing ^{a)} programs, staff, budgets, space, governance structure and equipment officially become part of FE/FES				X											
•Development Studies program, students, staff, budgets, space, governance structure and equipment officially become part of FE/FES				X											
•CSCD and all existing ^{a)} programs, faculty, staff, students, budgets, space, governance structure and equipment officially become part of FE/FES				X											
Standard SFU Name Selection and Approval Process															
<i>This standard naming/naming procedure is followed when there may be more than one option.</i>															
1. Special Advisor appoints a committee to consult members of Faculty, consider possibilities, and make a recommendation to the Special Advisor.	X														
2. Consultation process engaged in, including discussion and a naming symposium or roundtable (within Faculty only), and recommendation is made to Special Advisor.	X														
3. Special Advisor seeks confirmation of proposed name (usually one only, but could be presented with a choice), all faculty members in Faculty vote—does not include steering committees.	X	X													
4. Special Advisor receives vote results, writes memo to SCUP, via the VPA.		X													
5. SCUP receives, discusses, votes to approve and recommend to Senate.		X	X												
6. Senate receives, discusses, votes to approve and recommend to BoG.			X												
Faculty Administrative Structure															
<i>All units will transition into new Faculty with their existing administrative structure (i.e. REM as a School, GEOG as a Dept, CSCD as a Centre, EVSC as a program, Development Studies as a program).</i>															
•Special Advisor appointed by VPA	X														
•Special Advisor establishes Dean's Office and Reporting Structure	X	X	X												
→DAC (Dean's Advisory Committee)	X	X	X												
→Faculty Undergrad Curriculum Committee (FEUCC) ^{b)}	X	X	X	X											

[illegible]

FE/FES Blueprint and Development Timeline
Spring 2009 - Fall 2012

Nov. 7/08

	January 09	February 09	March 09	April 09 New Faculty comes into being	Summer Semester 09	Fall Semester 09	Spring Semester 10	Summer Semester 10	Fall Semester 10	Spring Semester 11	Summer Semester 11	Fall Semester 11	Spring Semester 12	Summer Semester 12	Fall Semester 12
Review and Implementation of Potential Programming															
1) Global Systems and Sustainability Strategies															
•Program specific development working group is established (under FEUCC)						X									
•NOI is developed					X										
•Full program proposal is developed with appropriate inter-unit and cross-Faculty consultation						X	X								
•Program proposal to FEUCC for intended start date of Fall 11								X							
•Senate committees and DQAB approval if necessary								X							
•IP in new calendar										X					
•1st student intake and registration											X				
•Program startup												X			
Ongoing review of priorities for new undergraduate program development by FEUCC.						X	X	X	X	X	X	X	X	X	X
Ongoing review of priorities for new graduate program development by FEGCC.						X	X	X	X	X	X	X	X	X	X
Ongoing evaluation of student interest in proposed new programming.								X	X	X	X	X	X	X	X
2) Biodiversity, Ecosystems and Conservation (or: Applied Ecology and Conservation)															
•Program specific development working group is established (under FEUCC) [which will consult with and may need to include reps from other Faculties i.e. BIO]												X	X	X	X
•Process as listed above under 1) Global Systems and Solutions												X	X	X	X
3) Water and Environment															
•Program specific development working group is established (under FEUCC) [which will consult with and may need to include reps from other Faculties i.e. Earth Sciences]															X
•Process begins as listed above under 1) Global Systems and Solutions															X
4) Environment and Development															
•Program specific development working group is established (under one or both of FEUCC/FEGCC)															X
•Process begins as listed above under 1) Global Systems and Solutions															X

SIMON FRASER UNIVERSITY

SCHOOL OF RESOURCE AND
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November 5, 2008

To: Members of the SFU Senate and SCUP

Subject: Creation of the Faculty of the Environment -- vote on the 1st of December 2008

Dear SFU Colleagues,

I am writing to you on behalf of the School of Resource and Environmental Management (REM) to strongly support the formation at SFU of a Faculty of the Environment (or a similarly named Faculty). This recommendation has support from all REM faculty members, who unanimously passed the motion that "REM enthusiastically continues to support and participate in the formation of a new Faculty of the Environment".

The reasons for our support are reflected in the recent report of the Faculty of Environment Interdisciplinary Program Planning Committee chaired by John Clague in Earth Sciences. They include:

1. A new Faculty of the Environment will demonstrate SFU's commitment to play an active role in addressing the environment and sustainability. The environment is an emerging global societal issue and it will increasingly shape the lives of Canadians, the Canadian economy and the workplace. The strong presence of SFU in the area of the environment is at the core of our university's aspirations ("thinking of the world") and its commitment to develop innovative integrative programs of high societal relevance.
2. The new Faculty will help to meet SFU's goal to offer novel, interdisciplinary programs. Achieving greater interdisciplinarity in academic programming was one of the main objectives of the Faculty restructuring process. The new Faculty will create the conditions needed to develop interdisciplinary academic programs in the area of the environment. Interdisciplinary programs have had a difficult time at SFU because in most cases they have not benefitted from the support of a Faculty devoted to their purpose. Therefore, it is important that large interdisciplinary academic programs, such as one concerning the environment, have the full support of a Faculty.
3. A new Faculty of the Environment will create new opportunities for SFU to attract undergraduate and graduate students over and above the current FTEs. There is currently a strong demand from students for undergraduate and graduate programs in the environment and this demand is expected to increase. Meanwhile, several other Canadian universities have

already reacted to these emerging opportunities. SFU should act now - and act strongly - to respond to this demand and develop the programs that are needed. SFU has much to offer and has the capacity to play an active role. Throughout the university there are many faculty members, students and staff with relevant expertise and interests. The new Faculty can provide the academic leadership in the area of the environment that is needed for SFU to better serve students and society.

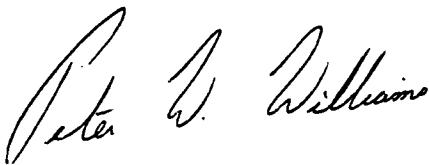
4. A new Faculty of the Environment will help SFU to attract new research and educational funding that is above our current levels. This is particularly timely given the provincial government's call to increase graduate education, including environmental education. A strong commitment and presence in the environmental field will position SFU better to receive funding from these public environmental initiatives (e.g. Pacific Institute for Climate Solutions), but private sources (e.g. donations) are increasingly important as well. Foundations such as the Gordon and Betty Moore Foundation, the David and Lucile Packard Foundation, the Bullitt Foundation and the PEW Charitable Trust are now, in some cases, larger sources of environmental funding than traditional government agencies. Additionally, the new Faculty will improve SFU's access to new sources of revenues that are currently beyond SFU's grasp. These new resources will add to existing resources and provide greater financial stability for the university.
5. The new Faculty of the Environment will be able to build upon the strengths and track record in teaching and research of the School of Resource and Environmental Management, the Department of Geography, Development Studies and the Center for Sustainable Community Development at SFU. Over the past 29 years, REM has developed an exemplary international reputation in interdisciplinary applied research, graduate degree programs, and undergraduate service courses. We have added to SFU's total graduate FTEs by offering a distinct "integrative and applied" interdisciplinary program of study in the area of the environment, not served in disciplinary programs at SFU. Students from our program have excelled at job interviews and have received excellent positions in the area of resource and environmental management.
6. The new Faculty can be developed without incurring major costs because much of the expertise and infrastructure needed to form the new Faculty is already present at SFU. The units that will make up the new Faculty are existing units. The main environmental undergraduate and graduate programs of the new Faculty have been in operation for many years. Instead, it is the "packaging" and updated mix of courses and programs to be offered by the new Faculty that constitute its greatest value added. The new Faculty of the Environment has a modest initial agenda focused on reshaping the existing undergraduate Environmental Science program. Potential new Faculty resources are expected to strengthen this program, increase FTEs to the university, and reduce reliance on current faculty members in the Faculty of Science and Faculty of Arts & Social Sciences.

In REM, we are looking forward to working with the Department of Geography, Development Studies, the Center for Sustainable Community Development and others at SFU to develop a strong presence for SFU in academic programming, research and community outreach in the area of the environment. We support an agenda for the new Faculty that focuses on

redesigning, streamlining, and presentation of the undergraduate environmental programs, the development of new opportunities for graduate students in the environment, and improving SFUs environmental presence in the local, regional and global communities. REM has much to gain from the development of the new Faculty because our highly successful program requires an appropriate academic home in which to thrive. At this point, we do not have this home and after thorough discussion on several occasions REM faculty have been unanimous that no existing regular faculty would be appropriate for us.

Thank you for considering these points. Feel free to contact me or any other Faculty member of the School of Resource and Environmental Management to discuss this matter.

Sincerely,

A handwritten signature in cursive script that reads "Peter Williams".

On Behalf of All REM Faculty Members,
Peter Williams
Acting Director
School of Resource and Environmental Management \

SIMON FRASER UNIVERSITY

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Jon Driver
Academic Vice-President
Simon Fraser University

November 14 2008

Dear Jon:

RE: Faculty of Environment

This brief letter is to confirm Geography's enthusiastic support for the proposed Faculty of Environment. As you know, Geography was a leading advocate for such a faculty at the onset of the Faculty Restructuring Process, initiated by your predecessor, and our initial proposal was developed in a submission in March 2007 to the SFU Phase 2 Task Force. This proposal was extensively debated within Geography and we have been vigilant participants in discussions, in Task Force hearings, the FIEPC process and related departmental discussions about the proposed Faculty's vision and implementation.

For the University, we anticipate that the Faculty of Environment will have considerable benefits. Concern for the environment cannot be divorced from the issue of human development and, in general, the Faculty of Environment symbolizes the University's commitment to Environment and Development, the principle challenges facing the global community in the 21st century. Clearly, the new faculty will most certainly *not* be the home for all research and teaching on the environment (or development) within the University. But the new Faculty of Environment will play vital, distinctive roles in offering inter-disciplinary programmes with an environmental focus. Geography is itself a remarkably inter-disciplinary discipline with its emphases on environmental processes, GIScience, human behaviour in place and space, and human-environment interactions. As a diverse discipline, Geography has long reached out and drawn upon expertise in a wide range of disciplines and we will play our part in ensuring that the Faculty of Environment is integrated with the expertise of the University as a whole.

REM and Environmental Science, along with Geography, the founding degree granting organizations of the proposed Faculty offer complementary programmes that together will provide undergraduate and graduate students with critical thinking and problem-solving skills that are vital to deep ('basic') understanding of environmental and

development processes and to identifying appropriate policy approaches and their evaluation.

In these financially challenged times, the costs involved in a new Faculty raise questions. Yet, the proposed Faculty of Environment will be a relatively small, lean (yet lively!) operation that will have an established faculty and student base. Moreover, its existence is likely to help the general fund raising activities of the University, and contribute to the development of strategic research grant applications based on expertise within the Faculty and around the University as a whole.

Geography encourages Senate to vote for the new Faculty of Environment.

Best wishes,

Roger Hayter
Chair, Geography

**Faculty of Environment and Sustainability
Interdisciplinary Programming Committee
Report**

Submitted to the Vice-President Academic
September 29, 2008

by

John J. Clague*
Diana Allen
Bob Anderson
Leah Bendell
Alex Clapp
Marilyn Gates
Michael Howlett
Karen Kohfeld
Mark Roseland

*Committee Chair

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Executive summary

An Interdisciplinary Program Planning Committee was created in April 2008 by former Vice-President Academic John Waterhouse to propose new programming at the undergraduate and graduate levels for the new Faculty of Environment and Sustainability (new proposed name, referred to subsequently as FES). The Committee was instructed to report back to Senate regarding this programming by Fall, 2008. The programming must be of an integrative nature, spanning the humanities, social sciences, and physical sciences. Among other aspects, consideration was given to how programs currently offered by the founding units of FES will be included in the suite of programs offered by the Faculty. Additionally, students from outside the Faculty must have access to Faculty courses, and relevant courses offered by other Faculties should be included in Faculty programs wherever feasible. The programs should enhance the research capacity of the Faculty, as well as the capacity of SFU for community engagement.

This report provides evidence that FES is widely supported across the SFU community, that the Faculty's programming will have pedagogical relevance and bring together and rationalize teaching on the environment, and that FES is a timely and appropriate strategic direction for the University. Taken together, these factors demonstrate that the Faculty is viable.

It is imperative that FES be approved and developed now, not only to bring the new Faculty on track with the overall faculty restructuring efforts, but also to align SFU with the similar developments at other universities and to respond to public, media, and government concerns about environmental issues. There is a high level of interest and energy to move this Faculty ahead that must be acted upon now or the opportunity may be lost.

The new Faculty is also timely because SFU will be able to capitalize on public funding initiatives, interagency ventures, and donor interests. Strong competition exists for external funding of university initiatives in the environment and sustainability, and the window for SFU to capitalize on these opportunities is narrow. The University risks falling far behind if there are any delays in proceeding with FES.

The founding units of FES are the Department of Geography, the School of Resource and Environmental Management (REM), the Environmental Science Program, the Development Studies program and the Centre for Sustainable Community Development (CSCD). These five units will enter the Faculty at startup in April 2009 in their current form, with their existing curricula, governance, and resources. The Faculty will maintain established curricula so that degrees in existing programs continue to be awarded. Existing curricula will also be a platform for future program development.

Research and teaching within FES initially will be delivered through the Faculty's founding units. The success of the Faculty, however, depends crucially on involving faculty of other University units, from outside of FES. Faculty mobility and cross-appointments should be encouraged and enabled.

The Faculty should be founded on a broad definition of the environment, including natural, built, social, and organizational environments. It necessarily includes theory, science, policy, and practice in all fields. It also embraces other traditions of enquiry that are not motivated by questions of human-nature relations, such as the many cultural, social, and economic aspects

of urban studies and sustainable communities, the geological tradition in earth sciences, and the society-space tradition in geography.

The Faculty will blend existing interdisciplinary environmental programs with important new thematic interdisciplinary programs (IPs) to which one or more founding units and units or individuals outside of the Faculty will contribute. This report proposes four IPs, but does not preclude development of others or further development of existing programs. The IPs embody themes in environmental research that bridge all of the founding units, and their inclusion and promotion in FES will help SFU realize synergies between units currently divided among different faculties. The IPs will enable those units and others to work together, allow the University to better utilize existing strengths and resources, demonstrate that the Faculty is unique and visionary, and attract students and FTEs. The IPs also offer exciting core programming and the potential for demonstrating the demand for FES credentials.

Four broad themes capture the spirit and intent of the new Faculty and are proposed as IPs: (1) *Global Systems and Sustainability Strategies*; (2) *Biodiversity, Ecosystems and Conservation*; (3) *Environment and Development*; and (4) *Water and Environment*. The Interdisciplinary Program Planning Committee envisions that these broad foundation programs could support a range of more specific programs. One such specific program, a possible *B.Sc. in Water Science*, is illustrated in a form it might take to show that it is deliverable with the resources and faculty currently existing at the University.

Global Systems and Sustainability Strategies

The focus of this new interdisciplinary program is *global systems* as they pertain to the natural environment, as they interact with social and economic systems, and as they are addressed by environmental policy and governance. The IP provides room for growth and a home for future, more specific programs. It logically fits within FES and ensures interdisciplinarity and practical application of research into policy and management. What separates this program from those existing at other universities is a focus on sustainable strategies as solutions to environmental issues. Solutions to environmental problems require integration of knowledge of both natural and social systems. This integrated approach with a focus on applied problems will provide a unique educational niche for SFU students to evaluate solutions to environmental problems. The IP is intentionally broad in order to provide a means of capturing new and innovative directions that will develop within FES. Specific foci that might exist beneath this interdisciplinary umbrella include, but are not limited to, environmental governance; climate change, mitigation, and adaptation; and a Master of Climate Action and Sustainability Leadership.

Biodiversity, Ecosystems, and Conservation

A successful FES must have ecological studies at its core. Addressing environmental challenges will require ever-growing scientific knowledge and monitoring of Earth's changing ecosystems, as well as an understanding of impacts of societal changes on policies, institutions, and practices. The educational goal of this program is to prepare students to meet future challenges by providing them with a solid basis that integrates biodiversity, ecosystems, and conservation, while building a practical understanding of the ways that natural and conservation sciences are used in policy-making and management of ecological systems. SFU has an opportunity to carve out a niche with this program by providing a unique curriculum with distinct linkages between the natural and social sciences. SFU already has strengths in this research area in REM, Biological Sciences, Geography, and several Centres.

Environment and Development

The *Environment and Development* program focuses on sustainable forms of development in the context of current unsustainable practices and their complex consequences. It examines the nature of the world's 'environmental movements'. Programming will be based on the premise that human impacts on ecological systems are largely manifested through development activity. Development in this context includes economic, technological, and industrial advancement, and social development of urban and rural settlements. Research on the ecological impact of resource use and production will be complemented by research on human environments – for example, urban settlements and landscapes, and the cultural and social practices they embody and articulate. This broad-based interdisciplinarity is required because, while social structures, systems, and networks create environments as places characterized by the human interactions that happen within them, individuals, groups, and societies socially construct and give meaning to many understandings of 'environment'. These constructs arise within the context of scientific and traditional knowledge about natural processes and phenomena. Public and private disagreements arise in the context of those understandings. The program will develop and test sustainable solutions to current and future environmental problems related to socio-economic advancement and will prepare students to become engaged in the development of new strategies for sustainability. *Environment and Development* encompasses a range of research and policy concerns in both developed and developing countries.

Water and Environment

Water quantity and quality issues are assuming increasing importance owing to growing water demand, changes in land-use, and competing interests for this resource. Universities have a major responsibility to educate future water scientists, managers, and policymakers to meet these challenges. Water is an immensely complex subject that requires mastery of many disciplines. The goal of the *Water and Environment* program is to provide students with training in the hydrologic and climate sciences, and with complementary strengths in environmental economics, biology, ecology, oceanography, coastal systems, social sciences, and law. Few interdisciplinary programs in water exist in Canada and elsewhere. The proposed *Water and Environment* program at SFU will be unique in that it will view water from an interdisciplinary perspective. It will establish SFU as a leader in water-related education in Canada. A *Water Science* degree, proposed within the *Water and Environment* program, is described in detail to demonstrate that it is viable with current University courses, resources, and research. SFU has a strong foundation in the physical sciences dealing with water.

General features of FES

New interdisciplinary programming within FES will follow a flexible template that provides all students with at least an overview of the environmental, economic, social, and institutional aspects of sustainability, while also allowing them to specialize more deeply in one of those areas. This idea has been incorporated into the proposed IPs through common core and capstone courses. Integration of interdisciplinary programming is justified in terms of the four pillars of sustainability: productive, natural environments; economically viable systems; sustainable social communities; and appropriate structures for institutions to achieve the other three pillars.

Co-operative education, international experiences, and other forms of experiential learning should be institutionalized and broadly available within FES to provide students with practical experience in their field of specialization.

An overarching FES goal should be to contribute to educating an environmentally informed citizenry. This goal can be achieved through the Faculty's curricula, but it also requires broader involvement in the University and external communities through, for example, public environmental literacy courses and community sustainability initiatives.

An opportunity exists for including in FES interdisciplinary programming of units outside the Faculty. SFU academic units that may wish to participate in FES programs, in addition to the founding units, include Archaeology, Biological Sciences, Communications, Chemistry, Earth Sciences, First Nations Studies, Humanities, Sociology and Anthropology, and Urban Studies. FES programs will deliver existing programs and courses from its founding units, but new programs will also be developed jointly with other Faculties. Possible exciting linkages exist with Health Sciences (global health), Business Administration (environmental economics), Engineering Science (environmental engineering), and Education (science and environmental education).

Faculty governance is the responsibility of the Office of the Dean, but FES is a hybrid faculty like no other in the University, and the administrative structure will have to support all units and facilitate programming across them and beyond. Participation of individuals and units outside the founding units of FES must be encouraged. It is essential to have a unifying administrative structure for new programming that will facilitate ongoing IP support. Such an administrative structure will provide a focal point for the advancement of new, innovative, and interdisciplinary research; ensure the delivery of excellent undergraduate programs; provide administrative support and representation for smaller units within the faculty; provide a home for faculty secondments, CRCs, and adjunct positions involved in undergraduate and graduate programs; solicit donors; and be responsible for community outreach efforts. An 'institute' is the Committee's favoured administrative home for the IPs and possibly some of the small, non-departmental units that will enter the Faculty.

The Committee recommends that an External Advisory Committee be established to advise the Dean on further development of FES. This committee would provide valuable informed 'outsider' advice on development of the Faculty and could serve as a bridge to professional, political, and other bodies. The External Advisory Committee should include, but not be limited to representatives of First Nations, environmental NGOs, the private sector, and SFU student groups.

Preface

Change is a salient characteristic of biophysical, social, ecological, economic, and political systems; often their one constant is change itself. Much change is unpredictable because we do not know enough about the human use of the environment and the interactions of various aspects of the environment with each other. Environmental changes associated with increasing population and economic activity are seen to be threatening to communities, nations and even the planet itself.

Protection of the integrity of ecosystem functions and processes requires an understanding of human uses and interactions with the environment. Threats posed by changes to Earth's environment necessitate an interdisciplinary approach to problem-solving and education. Contributions of technology, the natural sciences, humanities, and social sciences are all necessary to understand and solve environmental problems.

SFU is well positioned to tackle major problems such as the eight grand challenges for the future of environmental science identified by the U.S. National Research Council.¹ This approach is forward-looking and would distinguish SFU from many of the environmental initiatives that have been developed at other Canadian universities over the past 20 years.

Introduction

Committee and report background

An Interdisciplinary Program Planning Committee was created by the Vice-President Academic in June 2008 to prepare a report on undergraduate and graduate curricula for a new Faculty of the Environment and Sustainability (FES). Following provisional approval of the Faculty by SFU Senate, the committee was given specific terms of reference (see below), and the chair and members of the committee were appointed by John Waterhouse, who at that time was Vice-President Academic.

The Interdisciplinary Program Planning Committee was created to provide further justification of FES to Senate, which is the body empowered to formally approve the new Faculty. The Committee report is advisory to the Vice-President Academic, who will take it forward to Senate. Once the report is submitted to the Vice-President Academic and Senate approves FES, planning will occur through normal processes within the new Faculty under direction of the Dean and with the involvement of the units in FES and individuals outside it.

Senate approved the Faculty in principle in April 2007, but required further assurances that: (1) the Faculty would be widely supported at SFU; (2) the Faculty's programming would have pedagogical relevance and would bring together and rationalize teaching on the environment; (3) a new FES is an appropriate strategic direction for the University; and (4) the Faculty is viable. This report demonstrates that capacity exists within the University (teaching staff, research, and resources) and that a new Faculty has the potential to function effectively, to offer distinctive programming, and to make SFU a leader in environmental pedagogy and research.

¹ 2001 Report by the National Research Council, *Grand Challenges in Environmental Sciences*. The report identifies the following eight grand challenges: (1) biogeochemical cycles, (2) biological diversity and ecosystem functioning, (3) climate variability, (4) hydrologic forecasting, (5) infectious disease and the environment, (6) institutions and resource use, (7) land-use dynamics, and (8) reinventing the use of materials.

This report is a conceptual document. The Committee considered the structure of the Faculty as it might impact the delivery of new programming, recognizing that existing programming in founding units would continue. It did not have the mandate, to recommend structures that are the rightful responsibility of the new dean, once appointed. University policies such as the *Centre and Institutes Policy* and *Appointments Policy* provided only background information. Any changes to policies necessary to support the new Faculty will be addressed by those who have responsibility for those policies.

The Committee was not able to reach consensus on every detail of every proposal, but it enthusiastically supports moving forward with FES. All parties involved in the work of the past few months recognize the potential for FES to be highly successful. Just as important, there is the necessary good will and collegiality among the founding units and other cognate areas to make the new Faculty a reality.

Mandate of Committee: Terms of reference

The Interdisciplinary Program Planning Committee's terms of references, established by the Vice-President Academic, are to:

- Propose undergraduate programming in the field of the environment and sustainability of an integrative nature, bringing together knowledge from the humanities, social sciences and the sciences into thematic areas in the environment.
- Propose graduate programming in the field of the environment and sustainability of an integrative nature, bringing together knowledge from the humanities, social sciences and the sciences.
- Identify how programs currently offered by the constituent units of the Faculty at both the graduate and undergraduate level will be included in the suite of programs offered by the Faculty.
- In developing program proposals, ensure that students from outside the Faculty will have access to Faculty courses and that relevant courses offered by other Faculties are included in Faculty programs wherever feasible.
- Develop programs that will enhance the research capacity of the Faculty.
- Develop programs that will enhance the capacity of SFU for community engagement.

The terms of reference also require that guidelines be proposed for an administrative framework that will allow FES to succeed.

Committee members

John Waterhouse appointed John Clague as Chair of the Interdisciplinary Program Planning Committee. In consultation with Dr. Clague, he created a committee that would represent the founding units of FES, as well as other cognate units that contribute to teaching and research on the environment, for example Earth Sciences and Sociology and Anthropology. The Committee members and their home units are:

John Clague, Chair (Earth Sciences)
Diana Allen (Earth Sciences)
Bob Anderson (Communication)
Leah Bendell (Biological Sciences, Environmental Science)
Alex Clapp* (Geography)
Marilyn Gates (Sociology and Anthropology)

Michael Howlett (Political Science)
Karen Kohfeld (Resource and Environmental Management)
Mark Roseland (Centre for Sustainable Community Development, Geography)

**Dr. Clapp replaced Roger Hayter (Geography) in August.*

Barbara Wepruk served as the Committee Administrative Coordinator and Researcher.

Committee activity

Committee meetings were held on:

June 20
June 27
August 25
September 2
September 19
September 25

Much of the Committee's work and discussion was accomplished through e-mail. The Vice-President Academic instructed the Committee to submit its report no later than September 29 in order to support approval processes and timelines for creation and implementation of the new Faculty. Following presentation of proposals to Senate in November, the Committee's mandate will be fulfilled and it will disband. Due to the short time the Committee had to deliberate and formulate a report, the Vice-President Academic advised the Committee that its recommendations did not require wide consultation within FES units. Nevertheless, Committee members representing FES units have informed their colleagues, and some faculty members from outside the Committee have provided feedback. In addition, a well attended public meeting, chaired by Dr. Clague, was held at the Burnaby Mountain campus on September 25 to inform the University community on the Committee's recommendations, to receive further input from faculty, staff and students, and to answer questions.

Principles underpinning Committee's work

1. The new Faculty must offer undergraduate and graduate students a stimulating and challenge curriculum and research environment that integrates the humanities and the natural, applied, and social sciences.
2. The Faculty will balance science and social science content and perspectives. More specifically, the curriculum must include theoretical, critical, and applied perspectives that are integrated contributions of technology, the natural sciences, humanities, and social sciences, all of which are necessary to understand and solve complex environmental problems.
3. The structure for the new Faculty must have mechanisms that will:
 - a. achieve balance, thus enabling and supporting future interdisciplinary programming;
 - b. provide flexibility to allow for growth and to incorporate perspectives from others;
 - c. allow for cohesive unit and program growth and expansion;
 - d. ensure equitable input by all units into Faculty management and development.
4. New programs in the Faculty will focus on existing strengths and take the long-term view for further development. The Faculty should not try to do everything.

5. Development of social, and communication skills of students should be encouraged and incorporated into course content wherever possible.
6. The curriculum must include experiential learning opportunities, provided for example through field work, student internships, SFU International, and the SFU Co-op Program.
7. The undergraduate programs should have components that lead to an environmental degree as well as components that develop an environmental competence to accompany discipline-based majors.
8. The Faculty must strive to reach and serve the public, including non-traditional groups such as indigenous communities. Some element of community-based pedagogy is desirable.
9. Sustainability and the urban environment must be key components of the new Faculty's *raison d'être*.
10. Faculty members must have respect for others' disciplines and be open to collaborative and integrative research and teaching.

The Committee reviewed the extensive consultation process for the new Faculty that took place in 2007, prior to the Senate vote to provisionally approve the Faculty. Among other things, the Committee considered the *Report on Environment Visioning Workshop* (Appendix 1), which articulated part of the vision that appears in this report. The workshop was facilitated by Dr. Jock Munro, who also wrote its report. Several Committee members contributed to the visioning workshop.

The Committee reviewed current environmental programming, research, and teaching within the University and at selected other post-secondary institutions.

Existing Capacity in Environment and Sustainability at SFU

Existing capacity at SFU in the environment and sustainability is tabulated in Appendix 2 (Existing Environmental Programs at SFU), Appendix 3 (SFU Existing Environmental Courses) and Appendix 4 (SFU Existing Expertise within FES). Initially, research and teaching within FES will be delivered by the Faculty's founding units, however the success of new programming hinges on involving faculty from other units, perhaps even entire units. These other units include, but are not limited to Archaeology, Biological Sciences, Chemistry, Communications, Criminology, Earth Sciences, Humanities, Philosophy, Political Sciences, Sociology and Anthropology, and Urban Studies. Degree programs in FES might provide a strong complement to the thematic IPs proposed below, to existing undergraduate programs such as those in Environmental Science and Geography, and to graduate programs such as the REM MRM, Geography M.A. and M.Sc. programs, Ph.D. programs in Geography and REM, and the Development Studies Certificate program.

Initial Composition of FES

The founding units of FES are the Department of Geography, the School of Resources and Environmental Management (REM), the Environmental Science Program, the Development Studies Program, and the Centre for Sustainable Community Development (CSCD). These five

units will enter the Faculty at startup in April 2009 in their current form, with their existing curricula, governance, and resources.

The Faculty will maintain established curricula so that credentials in existing programs continue to be awarded.

Recommended Faculty Name, Mission, and Vision

Name: *Faculty of Environment and Sustainability*

Important but currently scattered teaching and research strengths at SFU are embraced and championed by the words 'environment' and 'sustainability'. The words also capture broader public, private sector, and government concerns that will dominate the public agenda through the remainder of this century. 'Sustainability' is intimately and inextricably associated with the environment and provides a balance to programming that is often seen to focus too much on physical sciences.

Mission: The Faculty of Environment and Sustainability exists to:

- prepare students to analyze environmental problems and advocate imaginative and sustainable solutions;
- create a dynamic atmosphere for conducting multi-disciplinary research that promotes better understanding of complex ecological and social phenomena.
- promote interdisciplinary research and teaching on natural and human environments and their interactions.

Vision: The Faculty of Environment and Sustainability will:

- explore the structure, integrity, and function of ecosystems and their distinct biophysical bases, with emphasis on local, regional, and global connectivity;
- create new understandings of past and present human developments so that the future can be better managed in its ecological context;
- critically appraise the risks associated with disturbed ecosystems and environmental conflict, and prepare students to negotiate new agreements, policies, and forms of governance to address those risks;
- promote a broad spectrum of critical scholarly and professional enquiry both within environmental fields and beyond them, and integrate new understandings with other humanist, social science, and scientific paradigms, including indigenous knowledge, in order to enhance their total explanatory power;
- strengthen multi-disciplinary approaches to the environment through the entire University and infuse them with the possibilities of sustainable development;
- inspire continuing leadership through the professional lifespan of faculty and staff, and maintain active working contact with expert networks built among our alumni, students, and communities; and
- build and enhance connections with other international programs that compare unsustainable development with sustainable change.

The mission and vision will be further discussed by the founding units and will require ratification once the Faculty is established.

Academic Themes and Interdisciplinary Programs

FES will deliver existing SFU environmental programs and new interdisciplinary programs (IPs) to which two or more founding units and units or individuals outside the Faculty can contribute. The broad framework of an administrative structure that fosters and protects interdisciplinary programs is proposed below:

Academic themes

The Committee recommends broad, guiding programming that will enable the new Dean to move forward with planning detailed programming and the related approval processes. The programs proposed here have the support of the Faculty founding units and demonstrate the considerable potential and capacity for a new Faculty of Environment and Sustainability.

The IPs proposed in this report:

- provide a framework for founding units and units or individuals from outside FES to work together on interdisciplinary programs;
- allow the University to better utilize existing strengths and resources;
- demonstrate that the Faculty is visionary and offers the potential for exciting core programming that capitalizes on the curricula of existing units, but is broader than can be achieved by any single unit alone;
- show that there is demand for FES and that it will be attractive to students.

Earth is constantly changing as a result of natural processes, of which social and economic systems are an integral part. In the past few decades, the international community has recognized the importance of not only increasing our scientific understanding of changes of the Earth system, but also of linking our scientific findings in a meaningful way to policy decisions and the management of natural and human systems on a variety of spatial and temporal scales.

In light of these realities, the Committee proposes four broad thematic areas of new programming, while recognizing that other configurations are possible. It viewed this programming from faculty and student perspectives. Specifically considered were the answers to questions: “*What type of degree would I like to get?*” and “*In what type of new program would I like to teach and do research?*” The four broad programs capture the spirit and intent of a new Faculty of Environment and Sustainability. The *Biodiversity, Ecosystems and Conservation* program is essential interdisciplinary ecological programming for a faculty focused on the environment and sustainability. *Global Systems and Sustainability Strategies* is also interdisciplinary; it moves beyond the theoretical by addressing solutions to the key problems facing natural and human systems today. *Environment and Development* broadens the social science focus of development studies to include foundations in the physical science of water, resources, and waste. Similarly, *Water and Environment* encompasses the sciences of hydrology and climate, as well as disciplines that address issues of water use, law, and policy analysis. These themes recognize that people and the environment are intimately and complexly linked and that innovative cross-disciplinary programming is required to understand this interplay.

The Committee envisions that these four broad thematic programs will support a range of more specific programs that provide students with an understanding of how humans and natural systems interact to affect the environment at scales ranging from local to global. The specific programs will place this knowledge within the context of social and economic systems, including policy analysis, governance, and management for the mitigation of, and adaptation to, those

changes. One such specific program is *Water Science (B.Sc.)*, which falls under the *Water and Environment* IP. It has been developed in detail to show that it can be delivered largely with the resources and faculty existing at the University.

The first set of thematic IPs created for FES is important because it will define the Faculty's intellectual terrain. The IPs need to be a small, strategically chosen subset of the possible options. Significant is interweaving the IPs with each other and between supporting units in order to define that terrain across the Faculty as a whole.

Common program elements

Interdisciplinary programs require a sense of continuity and common themes that justify their coexistence within one functioning, cohesive faculty. This idea has been incorporated into the proposed programs through common courses within each IP.

Integration of all interdisciplinary programming is justified in terms of balancing the four pillars of sustainability: productive, natural environments; economically viable systems; sustainable social communities; and appropriate structures for institutions to support the other three pillars. Each interdisciplinary program has each of the pillars represented within their curriculum, with changes in emphasis depending on the program. For example, a science program might emphasize the study of ecological systems and quantitative techniques, whereas a social science program might emphasize the study of governance structures and cultural dynamics.

New interdisciplinary programming within FES will follow a flexible template that provides all students with an overview of the environmental, economic, social, and institutional dimensions of sustainability, while also allowing them to specialize more deeply in at least one of those areas.

The Committee recommends core and capstone courses initially for students in new IPs and eventually for all environmental programming in FES. These should include a core 1st year course and a capstone 4th year course:

- A first-year course that introduces the four-pillar model of sustainability, thereby providing an initial framework in which students will build their knowledge of global systems. REM 100 might provide a model for this course.
- A fourth-year capstone seminar or workshop that is problem-oriented and would allow students to apply their learning to an explicit, modern-day environmental problem or situation. This course would provide students with experience in cross-disciplinary dialogue and different modes of delivery that they will encounter when working with people of different backgrounds and cultures in the 'real world'.

Core courses might also be offered at the 2nd and 3rd year levels. Examples include a course in 'environmental ethics' that incorporates examples of environmentally responsible citizenry and helps provide a cultural lens through which environmental, economic, and social issues and initiatives might be viewed; and a course in 'resource management institutions' that places an emphasis on both traditional and new and innovative governance structures including international and global interactions.

In keeping with the philosophy that underpins the fourth-year capstone course, other upper-level required courses might be developed that incorporate cross-disciplinary dialogues and real-world problem-solving approaches to expand on students' abilities to understand and deal with complex environmental problems.

The Committee also recommends that Co-operative education, field schools, international activities, and other forms of experiential learning be established in FES to provide students with practical experience in their field of specialization prior to graduation. In this context, there is a natural fit between the programming that will be offered by FES and that currently offered by the Semester in Dialogue and SFU International.

The focus of the IPs is at the undergraduate level, but the potential exists for development of more focused programming at the graduate level. For example, the Masters in Climate Action and Sustainability Leadership (MCASL), which is currently being developed by faculty at SFU, UBC, BCIT, and ECIAD at the Great Northern Way Campus, provides an excellent springboard for future programs developed in FES. Additionally, existing graduate programs at SFU offered, for example, by Archaeology, Biological Sciences, Earth Sciences, Economics, Geography, Public Policy, REM, Development Studies, and Sociology and Anthropology have the potential to contribute to, and draw students from, FES.

An administrative consideration for the Dean will be alternatives to FTE and student majors as basis for resource allocation. Such alternatives would enhance connections across existing units and programs and promote avenues for greater student participation in FES overall programming.

Common aspects of FES IPs

- IP themes capture and convey the essence of a new, interdisciplinary Faculty focused on environment and sustainability.
- Broad conceptual programs proposed here provide the new Dean with the framework for moving forward into detailed program development.
- Interdisciplinarity is consciously programmed into IPs. No degree can include all aspects offered by the Faculty, but programs must demonstrate interdisciplinary coverage.
- IPs provide unique positioning for SFU in academic environmental programming.
- Programs will capture the interest and enthusiasm of students.
- The Institute housing the IPs can provide a forum for faculty to contribute meaningfully to them.
- Programs should achieve a balance between the need for focused credentials with breadth.
- There can be no duplication of courses across units and Faculties.
- The Faculty should offer a common introductory course and one or more capstone courses to emphasize the interconnectivity of disciplines and strengthen students' sense of institutional belonging.
- Interdisciplinarity must have practical 'real world' perspectives.
- Accreditation for professional credentials should be incorporated into programs.
- Programs should have permeable boundaries and not be exclusive. Students will be encouraged to come from, or go to, other places for courses, and the Faculty should enable such exchange.
- Flexibility in curriculum and the ability to further develop the curriculum are essential.
- Timely program completion is essential.
- Course prerequisites across Faculties will require special consideration. For example, science prerequisites are tightly set; waivers are currently problematic. Internal FES unit waivers can be more flexible.

Proposed new IPs

Global Systems and Sustainability Strategies

Global Systems and Sustainable Strategies (Appendix 5a) provides room for growth and a home for future, more specific programs. The program logically fits within FES and ensures interdisciplinarity and practical application of research into policy and management.

'Global change' is often considered synonymous with 'climate change'; however this SFU program would differentiate itself with a focus on *global systems* as they pertain to the natural environment, as they interact with social and economic systems, and as they are addressed by environmental policy and governance at local to global scales. What also separates this program from others is a focus on strategies to achieve sustainability as solutions to environmental issues. Solutions to environmental problems require integration of knowledge of both natural and social systems. This integrated approach, with its focus on applied problems, offers a unique educational niche for SFU students to evaluate solutions to environmental problems that currently exist or are expected to arise. Researchers in this program will develop new strategies that integrate an understanding of social and natural systems and that therefore provide more effective approaches to sustainable development.

This IP is intentionally broad in order to provide a means of capturing new and innovative directions that could be developed within FES. However, there are several specific foci that might exist beneath its interdisciplinary umbrella. These foci would be reflected in a series of focused, upper-division courses that provide expertise in one area of Global Systems, for example Environmental Governance; Climate Change, Mitigation, and Adaptation; and a Master of Climate Action and Sustainability Leadership (MCASL).

Biodiversity, Ecosystems, and Conservation

A successful FES must have ecological studies at its core. Addressing environmental challenges will require much new scientific knowledge and monitoring of Earth's changing ecosystems, as well as a better understanding of impacts of societal changes on policies, institutions, and practices.

The goal of this program is to prepare students to meet future challenges by providing them with a solid basis that integrates biodiversity, ecosystems, and conservation, while building a practical understanding of the ways that natural and conservation sciences are used in policy-making and management of ecological systems (Appendix 5b). The program title expresses the rationale: 'biodiversity' captures the range of issues related to organismal biology and diversity; 'ecosystems' ensures that broader issues tying biodiversity to both ecological and physical processes are represented; and 'conservation' indicates that both of these are being viewed through an applied lens, with clear relationships to the relevant social sciences as well. SFU has a unique opportunity to carve out a niche with this program by providing concrete linkages between the natural and social sciences. This combined focus at the undergraduate level would be unique to SFU. The IP will have a social science component that addresses how the natural science will be used in conservation; i.e. political and practical use of scientific knowledge.

SFU already has existing strengths to support this program and a good complement of existing courses, programs, and expertise (Appendices 2, 3, and 4).

Environment and Development

This program focuses on sustainable forms of development in the context of current unsustainable practices and their complex consequences (Appendix 5c). The program will develop and test sustainable solutions to current and future environmental problems related to socio-economic advancement and will prepare students to become engaged in the development of new strategies for sustainability. *Environment and Development* encompasses a broad range of research and policy concerns in both developed and developing countries, and examines the nature of world 'environmental movements'. Programming will be based on the premise that human impacts on ecological systems are largely manifested through development activity. Development, in this context, includes economic, technological, and industrial advancement, and social development of urban and rural settlements. Research on the ecological impact of resource use and production will be complemented by research on human environments – for example, urban settlements and landscapes, and the cultural and social practices they embody and articulate. This broad-based interdisciplinarity is required because, although social structures, systems, and networks create environments as places characterized by the human interactions that happen within them, individuals, groups, and societies socially construct and give meaning to many understandings of 'environment'. These constructs arise within the context of scientific and traditional knowledge about natural processes and phenomena. This IP will address public and private conflict that arises in the context of those understandings.

Water and Environment

Water quantity and quality issues are becoming increasingly important owing to growing water demand, changes in land-use, and competing interests for the resource. Universities have a responsibility to educate future water scientists, managers, and policymakers to meet these challenges. Water is an immensely complex subject that requires mastery of many disciplines, from the sciences of hydrology, chemistry, and climatology to an understanding of social organization and the law. The goal of the *Water and Environment* IP is to provide students with a solid foundation in hydrologic and climate sciences, with complementary strengths in environmental economics, biology, ecology, social sciences, and law (Appendix 5d). Students and faculty within this program will study the impacts of environmental change on water availability and sustainability. They will quantify changes, assess impacts of future change, and apply this knowledge to develop strategies and policies to effectively protect and manage water resources, to mitigate harmful effects of environmental change, and to adapt to changes that cannot be mitigated.

Few interdisciplinary water programs exist in Canada and elsewhere, despite the importance of water at all scales. The proposed *Water and Environment* program at SFU will be unique in that it will view water from an interdisciplinary perspective and make SFU a leader in water-related education in Canada. SFU has significant strengths in the hydrologic sciences, marine biology, marine fisheries management and conservation, coastal zone management, water management, and policy that make a water-focused IP practical and achievable.

Water and Environment could be a stand-alone program or it could nest within *Global Systems and Sustainability Strategies*. It could offer a single degree program that emphasizes science with interdisciplinarity strengthened by common IP courses and humanities and social science breadth courses. An alternative is that two degree programs might be offered, one focused on science and the other on socio-economic and management issues.

One possible degree program (*B.Sc. in Water Science*) has been mapped out in a preliminary fashion to demonstrate that the new resources required for its delivery are minimal and that it

draws on a wide range of courses and research expertise relevant to water from across campus (Appendices 5 and 6). New resources required for this possible program are three courses and the proposed common capstone and introductory courses. The degree program proposed here is only one possible model for delivering water science to undergraduate students within FES. Much further discussion will be needed as part of new program development under the new Dean, and this discussion should involve all interested faculty.

Graduate Programs

Graduate student education is essential for the success of university-based research activities and is central to the mission of a research-intensive university. Graduate students are important members of the research community, both as research assistants and independent scholars. Graduate degrees currently constitute 18% of the University total.

Two FES founding units, REM and Geography, have flourishing graduate student programs. All M.Sc. students in REM and many M.Sc. and Ph.D. students in Geography are engaged in environmental studies, working with faculty whose primary research interests lie within the disciplines of the physical or social environment, or sustainability. In addition, a large number of faculty in other units at SFU, for example Archaeology, Biology, Chemistry, Earth Sciences, and Sociology and Anthropology, are engaged in research that contributes to the mission of FES. The proposed Institute of Environment and Sustainability could be the place for faculty in these other units to coalesce and collaborate, providing an extremely rich research environment for both faculty and graduate students.

New graduate programs can also be developed within each of the proposed IPs. To illustrate SFU's capability to mount a vibrant, world-class graduate program in the environment and sustainability, the following list details strengths currently existing at the University in *Water and Environment*, one of the four proposed IPs. SFU currently offers three graduate degree programs focused on aspects of water:

- Department of Geography – Hydrology, Climatology
- REM – Water Resources Management
- Department of Earth Sciences – Hydrogeology, Glaciology, Hydrogeochemistry

There is also potential for new graduate programs in the *Water and Environment* IP focusing on watershed planning/analysis/modeling, water policy, and water and economics. For example, a Water Policy program, perhaps offered as a joint program between the School of Public Policy and the Water and Environment Program, could focus on the policy nexus between the natural and physical sciences, social sciences, legal frameworks, institutions, and management issues confronting both the public and private sectors. The institutional arrangements that govern water allocation and water quality and the scientific basis for management decisions are of fundamental importance to water policy. The program would likely attract science graduates who have an interest in water policy.

Similar strengths in graduate research also exist in other proposed IPs: (1) *Biodiversity, Ecology and Conservation* – Biological Sciences' Ecology and Evolution Stream; REM's Applied Wildlife Ecology group and Forest Ecology; (2) *Global Systems and Sustainability Strategies* – Geography's research streams in Environmental and Atmospheric Science and in Power, Politics, and Policy; REM's The Climate, Oceans, and Paleo-Environments (COPE) Group; Earth Science's Centre for Natural Hazard Research; and the Centre for Coastal Studies.

It is reasonable to expect that within two years of the startup of FES, with joint faculty positions, faculty secondments and new faculty hiring both within the FES and more broadly across the university, SFU will be well positioned to move forward with new graduate programming in the thematic IP areas. In the interim, FES will come into being with a rich cohort of M.Sc. and Ph.D. students affiliated with its founding units.

Research and Teaching

The current SFU Strategic Research Plan (SRP 2005-2010) identifies the Environment as one of its key research areas. Establishment of the FES supports most of the major objectives of the SRP (Appendix 7), including:

- achieving thematic coherence in the expression of SFU's research interests;
- facilitating collaborations across disciplinary and institutional boundaries; and
- encouraging effective communication and dissemination of research results.

The advancement of excellence in research is now a defining feature of SFU. It is currently one of the top five universities in Canada with respect to research intensity, which is defined by the number of grants per 100 faculty members received from the three federal funding agencies. SFU must recruit and retain outstanding scholars who will attract highly qualified graduate students and champion bold initiatives, strengthen critical areas of research, develop new areas of excellence in research, and enhance synergies between teaching and research.

The SFU SRP identifies strategic research themes to maximize the University's strengths. These themes are interdisciplinary initiatives ranging from the humanities to the sciences that engage interests across the University community. Environment is identified as one of five key research themes. Not only will FES be the key proponent of the Environment research theme, it will overlap or link with components of the other four research themes:

- Economic Organization, Public Policy and the Global Community;
- Communication, Computation, and Technology;
- Culture, Society, and Human Behaviour; and
- Health.

In the Environment theme area, research clusters at SFU focus on the relations among economic development, conservation, and biodiversity in terrestrial and aquatic ecosystems, and natural hazard prediction and prevention. SFU research includes not only chemical, molecular biological, toxicological, physiological, and behavioural studies, but also risk assessment, management, and historic and economic considerations. The ultimate goal of much of this research is to provide a sound basis for sustainable development and responsible use of our natural resources. Researchers integrate economic, social, and environmental objectives in community development with the goal of designing policies that minimize negative impacts on ecosystems and urban communities. FES research would continue in areas emphasized in the SRP, including but not limited to:

Fisheries and Aquatic Ecosystems: Fisheries research at SFU is aimed at improving understanding and management of fish populations through research on marine and freshwater systems, including fish, marine mammals, birds, invertebrates, and their habitats.

Forestry and Terrestrial Ecosystems: Forestry research at SFU seeks to improve understanding of the forest ecosystem and to respond to challenges of natural and anthropogenic environmental stresses on forests. SFU also has extensive expertise in social science research on the forest economy of British Columbia and global trade in forest products.

Local Impacts of Human and Natural Disturbances: Research ranges from environmental geoscience to sustainable development strategies in studying the impact of human developments and natural disturbances on local communities and ecosystems.

The new Faculty should have procedures in place to acknowledge, value, and promote the full range of research approaches and publication venues within the founding units and within units that join the FES at a later date. Faculty policies should acknowledge and promote development-grant proposals (e.g. CIDA, IDRC, and RIIM) as well as grant proposals to the traditional funding councils.

FES will greatly strengthen SFU's capabilities in the environment by fostering interdisciplinarity and building on our strengths to define strategic research directions that will give the University a competitive advantage. The new Dean will have to devise measures that will support and promote collaboration across units within FES, and between FES and units outside it. Experience from interdisciplinary departments should be utilized to foster such activity. For example, REM has found that one way of enhancing multidisciplinary collaborations among diverse faculty is through graduate student projects. M.Sc. and Ph.D. students within REM are required to develop projects that integrate natural and social sciences. Many successful interdisciplinary research collaborations have naturally developed through the involvement of faculty members in these student projects. One approach for encouraging new, innovative, and collaborative research at the graduate and faculty levels is to intentionally design M.Sc. and Ph.D. degree programs within the IPs that require student theses to address their topics in an interdisciplinary manner.

Another successful model for developing interdisciplinary research collaborations is seen in the Integrative Graduate Education and Research Traineeship (IGERT) program sponsored by the U.S. National Science Foundation. This program provides funding to institutions for well designed, problem-oriented, graduate research projects that integrate research from several fields. It fosters excellence in graduate research and also provides a springboard for fruitful collaborations at the faculty level. SFU's Community Trust Endowment Fund (CTEF) supports similar types of research in the field of the environment, including one on secondary impacts of climate change in British Columbia that has brought together faculty members from Earth Sciences, Communications, Health Sciences, REM, SIAT, and Statistics. The Committee recommends that this program be expanded. One means of encouraging interdisciplinary research at the graduate and faculty level is to earmark a set of graduate fellowships that demonstrate an integration of research across multiple units within the Faculty and the university.

Faculty interactions to develop productive research relationships are through problem-based teaching at the upper-level undergraduate and graduate levels. FES might offer a rotational, Faculty-wide, problem-based course that is designed and co-taught by instructors from several units within the Faculty. Although such courses are recognized as being labor-intensive for faculty members, they could be encouraged by incentives such as teaching release.

An administrative consideration for the Dean will be alternatives to FTE and student majors as basis for resource allocation. Such alternatives would enhance connections across existing

units and programs and promote avenues for greater student participation in FES overall programming.

SFU Niche

SFU has significant strengths and interest in the environment and sustainability. This fact is evident in the University's broad course offerings, research, and its existing undergraduate, graduate, and community outreach programs. Other Canadian post-secondary environmental and sustainability initiatives are not as demonstrably interdisciplinary as SFU's could be. FES will be strategically planned for maximum interdisciplinarity and will provide base environmental and sustainability programs as well as unique solution-oriented programming. Assuming that SFU's existing interdisciplinary programming is combined with the thematic IPs proposed here, the University has a chance to take the lead in academic programming in Canada in the fields of environment and sustainability.

SFU has demonstrated experience in mounting complex interdisciplinary programs that provide certification needs in specific fields, for example accreditation for the Master's of Resource Management by the Canadian Institute of Planners and the Planning Institute of BC; and accreditation of graduates of Physical Geography and Earth Sciences by the Association of Professional Engineers and Geoscientists of BC. SFU also has a history of unique community outreach, which is evident in non-academic courses, public activities, and the creation of the environmentally friendly UniverCity on the Burnaby Mountain campus.

Demand

Research is required on marketability, demand, and comparative programs across Canada and abroad. In the next phase of academic program development for FES, market research on specific proposed IPs should be done as part of the regular program development and approval process.

Market: Current climate and future research

Environmental issues have high political and public profiles and are receiving extensive media attention. Governments are increasingly supporting initiatives in the environment and sustainability (Appendix 8), and the Office of the Vice-President Research has included 'environment' in its current strategic mandates (Appendix 7).

Two key market factors will drive demand for students with a broad education in environment and sustainability. First is an aging labour demographic; with high retirement turnover, jobs will open. Second, the public and industrial sectors, for economic reasons, are increasingly placing importance on the environment and ecological sustainability. This change is driving new technologies and a growing need for expertise that can address new organizational priorities and that can use developing technologies.²

² <http://blog.lidc.sfu.ca/careerservices/p=1344> The "green" collar job boom: Environmental sector growing 60% faster than economy.

Target student base: Credentials and careers

The goals of a successful undergraduate program within FES are threefold: (a) to groom students for further education in graduate programs; (b) to prepare students for employment; and (c) to make them more environmentally aware citizens. Interdisciplinary programs that are designed to satisfy goals (a) and (b) are likely to differ in design. The former will provide stronger scientific credentials for students intending to pursue graduate degrees or careers in science. For example, students obtaining a degree in *Biodiversity, Ecosystems, and Conservation* will be prepared to pursue graduate degrees in programs such as ecology, conservation, environmental policy, and environmental management and regulation. They will also be prepared to pursue careers in political science, public policy, law, business, communications, resource management, climatology, applied biology, environmental earth science, and education. Development of skills in critical thinking, analysis, writing, and communication will provide students a competitive advantage in all job markets.

Career fields for graduates of FES include, but are not limited to, environmental management and regulation, ecology, environmental policy, conservation, waste management, outdoor recreation management, research and development, and academia. Potential employers for students with either a B.Sc. or B.A. degree include government, non-governmental organizations, consulting firms, state and federal agencies, firms specializing in conservation, ecology, and environmental issues, resource industries, and scientific and research groups.

Employers of students with an environmental education generally request a minimum of an undergraduate degree in an environmental, ecological, or conservation program³. Programs that target students who are not seeking post-graduate credentials could offer either a B.Sc. or B.A. degree. A B.A. degree program could follow a liberal arts degree model that would have a core focus in sciences but with fewer required credits in natural sciences. This option would provide more freedom to pursue courses more broadly across relevant disciplines within the Faculty, such as environmental governance, development, and the environment, and outside the faculty, such as archaeology, First Nations studies, public policy, urban studies, and anthropology. It would be aimed at students with an interest in topics such as environmental governance. A B.Sc. degree would require a strong set of science courses, but also an appropriate number of social science courses to provide students with a balanced societal perspective in which their scientific knowledge will be applied.

Whenever possible, requisites for professional credentials other than academic degrees, and practical experience, should be incorporated into programming. Job Futures, Service Canada⁴ reported that 53% of students who had prior work experience in environmental and conservation technologies found a job within one month of graduation. They also found that 93% of these students were employed two years after graduation and that average annual earnings are \$33,300 to \$42,000.

Competition

Many post-secondary institutes are striving to be interdisciplinary in the field of environmental education. However, to date most universities and colleges have a specific focus and minimal courses or programs to support their claims to true interdisciplinarity. SFU has the capacity through its existing expertise, courses, and programs to quickly take the lead in interdisciplinary academic programming and research in the environment and sustainability. The thematic IPs

³ Seen in 89% of B.C. environmental related job postings reviewed July/Aug 2008.

⁴ <http://www.jobfutures.ca/fox/C640>

proposed in this report will be unique to SFU, as would other possible academic programs in areas such as *Environment and Communication*.

Community Involvement and Outreach

An overarching FES goal must be to contribute to educating an environmentally informed citizenry. This goal can be achieved through the Faculty's curricula, but it also requires broader FES involvement in the University and external communities (local, regional, federal, and global). Consideration should be given to offering environmental literacy courses or an Environmental Literacy Certificate to train SFU students to be more environmentally literate citizens.

Issues surrounding the environment and sustainability are of critical importance to the public. FES will have a tremendous opportunity early in its existence to respond to public interest in these issues through faculty and student involvement in community activities. Examples of such activities include faculty and student lectures, public events for community and school groups, and student involvement in community environmental activities.

SFU is surrounded by nearly 600 hectares of conservation land, including forest. This area offers a wonderful opportunity for expanded academic as well as community outreach, urban ecology research, and other initiatives. Ecological systems in cities are of increasing interest and importance to communities and governing bodies, and SFU is ideally situated to engage in such activities.

Current sustainability activities on the Burnaby campus that could be fostered and energized by FES include:

- Sustainability Advisory Committee
- Campus Sustainability Assessments Program
- SFU Sustainability website
- SFU Sustainability Policy
- University community initiatives such as *Waste Reduction through Composting Pilot program* and *The 2008 Sustainability Festival*
- UniverCity
- Student groups and clubs

Integration with Other Faculties

An opportunity exists for contributing to interdisciplinary programming of units outside the Faculty. For example, an environmental minor might be offered to students in Business Administration. The Strategic Learning Group in Business Administration already deals with sustainability; an environmental minor for their students would provide a unique niche for SFU Business Administration students. Such a minor could include existing courses such as corporate and social responsibility in the context of environmental issues. Many major environmental institutes and NGOs are using business models to appeal to corporations and the public (an example is Stanford University's Natural Capital Project, which focuses on ecosystem services and the valuation of those services).

SFU academic units that may wish to participate in FES programs, besides the founding units, include Archaeology, Biology, Chemistry, Earth Sciences, First Nations Studies, Sociology and

Anthropology, and Urban Studies. Collaboration between faculty in REM and Archaeology has developed an increasingly important body of ecosystem data and of insight into ancient and long-term change in human ecosystems. First Nations Studies provides compelling alternatives to accepted definitions of environment, research, and knowledge, as well as guidance in forging collaborations with aboriginal communities.

FES programming will deliver existing courses from its founding units, but, as mentioned earlier, courses should also be drawn from other faculties including FASS, the Faculty of Science, and new Faculties including Health Sciences. Exciting linkages could also be developed with Health Sciences, Business Administration, Engineering Science, and Education.

SFU Centres and Institutes with environmental strengths and missions

Many existing centres and institutes at SFU are relevant to FES. These centres facilitate collaborative research, especially multi-disciplinary research. They also undertake specific types of teaching or training programs, facilitate multi-university initiatives such as Centres of Excellence, and provide specific types of services to the community:

- Centre for Wildlife Ecology
- Centre for Natural Hazards Research
- Centre for Coastal Studies
- CRC in Fisheries Risk Assessment and Management
- CRC in Glaciology
- Cooperative Resource Management Institute
- Institute of Governance Studies
- Institute for the Humanities
- Centre for Global Political Economy

Some of these Centres may wish to relocate within FES once the new Faculty is established.

Other SFU interests in FES

There is a great deal of interest across the University in the potential for collaboration with FES. Expressions of interest since the new Faculty was proposed to Senate in April 2008 have been received from:

- Semester in Dialogue
- School of Engineering Science
- Department of Sociology and Anthropology
- Faculty of Education
- Department of Economics
- Centre for Canadian Studies
- School of Communication
- Department of Biological Sciences

Further expressions of interests are welcome and continue to be submitted.

Inter-institutional interests

- Centre for Interactive Research on Sustainability
- Bamfield Marine Sciences Centre
- Pacific Institute on Climate Change Solutions (PICS)
- Neptune Canada Seafloor Observatories

Administrative Structure to Support IPs

Faculty governance is the responsibility of the Dean. FES is a hybrid faculty, like no other in the University, and the administrative structure will have to serve all units and facilitate programming across them and beyond. Participation of individuals and units outside the initial FES must be encouraged, for example by including external representation on planning committees. Inclusion of individuals and units outside FES in meaningful ways will enhance and promote the development of the Faculty and enrich and provide greater scope to programming.

Structural models

It is essential to have a unifying administrative structure for new programming that will facilitate ongoing IP support. Such a structure could be a temporary arrangement, for example over the first three to five years of the Faculty.

The rationale for such an administrative structure is to:

- provide a focal point for the advancement of new, innovative, and interdisciplinary research;
- administer excellent new IPs effectively and efficiently;
- provide administrative support and representation for smaller units within the faculty;
- provide a home for faculty secondments and adjunct positions involved in new IP undergraduate and graduate programs; and
- solicit donors and be responsible for community outreach efforts.

The Committee considered a variety of structural models that could meet these requirements. Any model must support and promote the central, environmental and sustainability themes of FES, its mission and vision, and also provide a cross-unit interdisciplinary base. IPs embody the signature themes of the new FES and need both cross-unit and administrative support. The structure must also support the smaller founding units of the FES, providing adequate resources and recognition within a Faculty that comprises a variety of units (a school, a department, and programs).

An 'institute' is the Committee's favoured administrative home for the IPs and possibly some of the small, non-departmental units that will enter the Faculty. Such an institute would not duplicate what existing units already do. Rather, the primary purpose of the institute would to promote the signature themes of FES and have a cross-unit programming capability. Non-departmental and non-school units could be included in the institute, where they would receive support and greater visibility.

Attainment of the level of integration required of the new Faculty could be facilitated by the creation of a new stand-alone research and teaching institute, the *Institute of Environment and Sustainability*. The Institute would both bring together teaching and research resources from within and outside the Faculty and act as an incubator for new programs. It could be based on the structure of the IHRE in the Faculty of Health Sciences.

The institute could serve as a:

- home for new IPs;
- catalyst for inter-unit and cross-University collaboration;
- research base;

- home for cross-appointments, CRCs, and secondments;
- vehicle for fundraising;
- mechanism for community outreach;
- structure for managing centres entering FES;
- home for IP undergraduate and graduate curriculum committees and tenure and promotion committees;
- structure for supporting other units and faculty members that might enter FES after it is created; and
- mechanism for promoting University literacy on environment and action on sustainability.

The University has a policy on Institutes that restricts what they can do. Research is the current focus of SFU institutes and, to date, SFU Institutes and Centres that do offer some courses toward credentials offer only certificates and diplomas. With the exception of the Centre for Canadian Studies, they offer no degrees. A structure to enable the necessary functions proposed in this report (teaching, tenure and promotion committees, appointments) within an institute does not yet exist at SFU. Ultimately, the Centres and Institutes Policy should be revised; this responsibility lies with the Vice-President Research. The Office of the Dean should provide administrative support for new IPs and possibly for smaller founding units.

A second structural model that was considered involves a steering committee established to oversee the IPs. As is normal procedure within the University, the steering committee could report to the Office of the Dean.

Several further considerations involve promotion of the diverse academic cultures of units bridging the social and natural sciences and those in the new Faculty whose primary focus is other than environmental. FES should foster continued and strengthened connections within as well as across units. Faculty hires within existing units should reflect all areas of scholarship within the discipline, including fields that are not primarily concerned with the biophysical environment. FES should also promote a range of scholarly approaches in science, social science, and the humanities, and their associated publication outlets and funding vehicles. For example, the new Faculty should appreciate and promote social and critical theory and basic research in the sciences just as it needs to promote applied research in policy and governance. Publication in traditional outlets in the humanities, especially books, should be integrated into FES criteria just as there should be acknowledgement of the importance of refereed journals as the primary publication mode in the sciences.

Urgency of Establishment of FES

The new Faculty must be approved and developed now, as delays work against the University's interests. Approval will bring the new Faculty on track with the overall faculty restructuring efforts, and, more importantly, align SFU with recognition by the public, industry, and governments that the environment is among the most important issues the world faces over the remainder of this century. Additionally, there is a high level of interest and energy across the University to move this Faculty forward, which should be built upon now.

Approval of FES will also allow SFU to capitalize on public funding initiatives, interagency ventures, and donor interest in the environment and sustainability. There is strong competition for funds from these sources from other universities that are developing similar programs (Appendix 9), and SFU might lose out on these time-sensitive opportunities if FES is delayed.

The Way Forward

Further discussion

To allow FES to develop to its full potential, the next phase of FES planning should involve further discussions among the founding units and interested groups and individuals outside the Faculty, within the larger University community. One suggestion is that the Acting Dean organize a working group of specialists that would develop details of the proposed interdisciplinary programs.

Further development of the Environmental Science Program

One of the reasons that FES was created was to provide a nurturing home for the Environmental Science Program and to allow the program to flourish beyond the current demand for two existing streams. The creation of the new Faculty of the Environment and Sustainability will enable development of curriculum that is much more innovative, flexible and addresses future needs in the field of Environmental Science. The Environmental Science Program will enter FES in its present form, but it must evolve under the leadership of the new Dean and with appropriate consultation with the other founding units.

The External Review of the Environmental Science Programs recommended that the program become a department. FES will allow for the development of such an interdisciplinary undergraduate program, where the student learns not only the science behind a particular environmental issue, but also can study the societal and political concerns that can make the issue controversial and complicate solutions.

The Environmental Science Program at SFU was established in 1996. The initial steering committee responsible for the development of the program included representatives from the Departments of Mathematics and Statistics, Physics, Chemistry, Biology, and Geography. Once it became established as a Department, Earth Science became a member of the committee. Currently, the program six streams

- Biology
- Chemistry
- Environmetrics
- Physical Geography
- Pollutant Transport
- Quantitative Techniques for Resource Management

Establishment of FES provides an opportunity to restructure the Environmental Science Program to make it more innovative and forward-looking. The Program can:

- build on the strengths of the other founding units, and
- be inclusive of other Faculties and Centres, for example Health Science, Arts and Social Sciences, and the Centre for Coastal Studies.

Redevelopment of the Environmental Science Program should be a priority of the Office of the Dean once FES is established. Program changes were recommended during an external review of the existing Program in 2006. Key recommendations included redesigning the existing Program and changing it to a Department of Environmental Science within a new Faculty of the Environment.

Secondment and joint appointment of faculty outside founding units

Faculty mobility and cross-appointments should be encouraged and enabled. The institute could provide a place where faculty members from outside FES could be housed, but they could also be housed within one of the founding units. All secondments, new faculty, and adjunct positions will not be solely associated with the Institute. For example, some founding units have appointments from the Vice-President Academic that must be respected.

Funding examples

SSHRC: The Canadian Government's 2008 Budget provided targeted funding for research on the environment and the North. SSHRC has announced two special calls for applications on priority topics:

- climate change impact, mitigation and adaptation;
- energy and natural resources;
- water; and
- the environmental impact of new technologies.

Canada Excellence Research Chairs Program: To expand its Science and Technology strategy and strengthen Canada's ability to attract world-class researchers and doctoral students, CERC will establish 20 new Canada Global Excellence Research Chairs in priority research areas, two of the four of which are FES related: 1) Environmental Sciences and Technologies; and 2) Natural Resources and Energy.

External collaborations

The recently created Pacific Institute for Climate Solutions (PICS) could link with FES and satisfy the PICS educational mandate. PICS was recently approved by BC Premier Gordon Campbell; it is hosted by the University of Victoria and operates in collaboration with the University of British Columbia, Simon Fraser University, and the University of Northern British Columbia. PICS has an endowment of \$90M and was provided \$4.5M in operational funding for its first year, 2008. In addition to funding graduate fellowships, PIC program responsibilities include "facilitating and promoting knowledge transfer activities."

First Nations

The Committee recognizes that there is a strong connection between the interests of First Nations, Inuit, and Metis communities and the core issues of the Faculty of Environment and Sustainability. SFU already has institutional relationships with some First Nations. Examples include the Chief Dan George Centre, which has institutionalized a relationship with the Tsleil-waututh, and existing relationships between First Nations and the Departments of Anthropology and Archaeology.

The Committee recommends that there be a significant focus on First Nations within FES. It recognizes, however, that establishing stable and productive relationships with First Nations is an important part of the consultation process. Establishment of this relationship requires more time and a more involved protocol than could be initiated by our Committee over the summer months. Initiating this process is a crucial part of creating a new Faculty that is inclusive and inherently true to the philosophy of sustainability. As such, we recommend that SFU set up a working group as soon as possible to begin to identify and engage First Nations stakeholders in this consultation from a position of reciprocal respect. This group would be responsible for

establishing and following a protocol of consultation, which could involve sending a public letter announcing the formation of a new Faculty and planning in-person visits that would begin to build partnerships and facilitate First Nation involvement. We also recommend that an advisory group representing First Nations be established to provide ongoing input to the development of programs within FES.

External Advisory Committee

The Committee recommends that an External Advisory Committee be established to advise the future Dean on further development of FES. This committee would provide valuable informed 'outsider' advice on development of the Faculty, and could serve as a bridge to professional, political, and other bodies. It might also provide opportunities for external funding for FES. The External Advisory Committee should include, but not be limited to representatives of the SFU student body, First Nations, environmental NGOs, and the private sector.

Recommendations

- Broad Interdisciplinary Programs should be established within the Faculty of Environment and Sustainability to permit the new Dean to move forward into detailed programming and related approval processes.
- Interdisciplinary Programs must be flexible but provide all FES students with at least an overview of the environmental, economic, social, and institutional dimensions of sustainability, while also allowing them to specialize more deeply in one of those areas.
- The Committee recommends establishment of four thematic Interdisciplinary Programs, which capture the spirit and potential of the new Faculty. Each of the IPs will have a leader that reports to the Office of the Dean through an Institute or Advisory Committee.
 - *Global Systems and Sustainability Strategies*
 - *Biodiversity, Ecosystems, and Conservation*
 - *Environment and Development*
 - *Water and Environment*
- The Interdisciplinary Programs require a home independent of the founding units. One option is an Institute with a Director. Another, less creative option, but one that does not require a change in SFU's Centres and Institute policy, is an Advisory or Steering Committee. Given the need for an Institute with the capabilities outlined in this report, the Committee recommends that Vice-President Research give priority to revising the existing Centres and Institutes Policy to allow the Institute of Environment and Sustainability to be established.
- Core and capstone courses, required of all students in new FES programs, should be developed once the new Faculty is established.
- Co-operative education, international opportunities, and other forms of experiential learning should be established within FES to provide its students with community-based learning at both undergraduate and graduate levels.

- The new Dean should seek alternatives to FTE and student majors as basis for resource allocation within FES. Such alternatives would enhance connections across existing units and programs and promote avenues for greater student participation in FES overall programming.
- An External Advisory Committee should be established by the Vice-President Academic to advise on the further development of FES.
- FES must have an outward-looking attitude and involve itself in communities of all sizes, from the University to global. Sustainability requires such vision.

Appendix 1

A VISION FOR ENVIRONMENTAL PROGRAMMING AT SIMON FRASER UNIVERSITY

A Report Submitted to the Phase 2 Task Force on Academic Structure

J.M. Munro

November 5, 2007

EXECUTIVE SUMMARY

It is not surprising that environmental programming emerged as a topic in the current examination of academic structure at Simon Fraser University. The burgeoning public and media interest in environment and sustainability hardly requires comment and the emergence of uncertainty concerning both the scientific basis for many of today's environmental issues and the design and implementation of policies to address these issues is a call for universities to consider how to best use their substantial environmental capabilities.

The Report of Working Group 3 of the Phase 2 Task Force on Academic Structure recommended that a facilitator be appointed to conduct a visioning process to clarify the thematic foci and major programmatic and research areas of a potential environmental initiative for Simon Fraser University. This is the final report of the facilitator. It has benefited enormously from the input received in all these interactions. The report is a summary of opinions and arguments, not a statement of consensus.

A. CURRENT ENVIRONMENT AND SUSTAINABILITY ACTIVITIES AT SFU

SFU has been addressing environmental problems from its earliest years. Across many departments (Schools, Departments, and Programs), SFU's environmental programming and research activities have greatly expanded over the decades.

Departments and Faculty Members There is a widespread interest in environmental topics. There are 23 departments with at least one environmental course and over 70 faculty members with environmental interests. This suggests that there could be opportunities for faculty and program collaboration that are not being realized.

Students Many measures of student interest in environmental programs show relative decline or, at best, stability. Given the general interest in environment and sustainability and increased environmental employment, this is not what we would expect and it may indicate defects in the design and delivery of environment-related programs.

Research Environmental research obtains funding above the University-wide average. The inclusion of "Environment" as one of five themes in the current Strategic Research Plan appears to be well-founded.

Outreach SFU does more environmental outreach than is generally recognized but, based on the level of public interest and the success of SFU's current outreach activities, much more could be done to reach government, schools, industry, and the general public.

Sustainability Profile

Despite being a signatory to the Talloires Declaration on university sustainability, SFU has yet to create a public profile as a sustainable campus. This is in marked contrast to some other Canadian universities, notably UBC. However, SFU now has a meaningful sustainability policy at the final draft stage.

B. ENVIRONMENT AND SUSTAINABILITY AT OTHER CANADIAN UNIVERSITIES

Many Canadian universities have institutionally more prominent environmental units than SFU, more environmental degree programs and seem to have established better integration with related departments in their university. The other three research universities in BC are, in various ways, ahead of SFU in environment and sustainability programming despite proportionately similar capabilities.

C. A NEW ENVIRONMENTAL PROGRAMMING VISION FOR SFU

In the various consultation opportunities leading up to the completion of this report there was a strong consensus for SFU undertaking a significant environmental programming initiative. Major academic restructuring in the University at the same time as greatly expanded interest in environmental issues among governments, funding agencies, potential donors, and society as a whole offers a unique opportunity, in the view of most consultation participants. The following important elements emerged:

- concentrate on the relationships between natural environment and the other aspects of the human environment so that outcomes such as “sustainability” are defined in terms of the natural environment
- bring together the humanities, natural, applied, and social sciences in an integrated multi- and inter-disciplinary strategy
- majority support for a Faculty of the Environment and Sustainability (FES) rather than an environmental and sustainability institute
- key opportunities were identified for improvement and expansion of undergraduate education
- many opportunities for large scale research projects and programs involving researchers at many institutions and a central environmental unit at SFU would help SFU’s opportunities for participation
- outreach and policy impact are important and SFU should strive to reach and serve the public and private sectors
- great interest in organizational options and issues

- five types of participation of faculty members in the environmental initiative: (1) all faculty members in an existing unit; (2) individual faculty members transferred on a permanent basis; (3) individual faculty members with joint appointments; (4) individual faculty members on part- or full-time secondment for a fixed period of 1,3, or 5 years; and (5) affiliated (Associate Member) involvement.

D. REVIEW OF ORGANIZATIONAL OPTIONS FOR SFU

Four organizational options for a possible environmental initiative were identified by the Working Group.

1. Maintaining the status quo is the easiest option, but disadvantages outweigh advantages.
2. The environmental institute option would be a low-key and non-threatening way of encouraging interdisciplinary work on the environment and sustainability but its disadvantages are greater than its advantages.
3. A new School of Environment and Sustainability created either out of the current School of Resource and Environmental Management or in addition to it would create more presence for environmental and sustainability teaching and research but present many organization structure problems.
4. A new Faculty of Environment and Sustainability would be the strongest response to the current opportunity. This option seemed to have majority support among consultation participants. It would elevate the priority of environment and sustainability, gather University-wide participation, facilitate program development, and be seen to address SFU's societal responsibilities. The disadvantages of a new Faculty would be financial and administrative costs and possible difficulties in reaching general agreement on priorities and programs.

E. CONCLUSION

Although SFU has considerable strengths in the field of environment and sustainability, many universities across Canada seem to be doing more. It seems unlikely that SFU will secure many of the benefits presented by increasing research and programming opportunities if it keeps its organizational and programmatic status quo. The weight of opinion gathered in the consultation process leading to this report strongly supports SFU undertaking an environmental programming initiative now and most opinion supported the creation of a Faculty of Environment and Sustainability.

INTRODUCTION

It is not surprising that environmental programming emerged as a topic in the current examination of academic structure at Simon Fraser University. The burgeoning public and media interest in environment and sustainability hardly requires comment and the emergence of uncertainty concerning both the scientific basis for many of today's environmental issues and the design and implementation of policies to address these issues is a call for universities to consider how to best use their substantial environmental capabilities.

The Report of Working Group 3 of the Phase 2 Task Force on Academic Structure⁵ identified three organizational options for a possible environmental initiative:

- status quo;
- an institute;
- a new School or Faculty. This is really two options - departments⁶ operate at a different level in SFU's organization than Faculties and have different responsibilities.

The Report also included three guiding objectives with respect to the desired outcome of any new organizational arrangements:

- Enhancing the education and experience of students;
- Creating an environment that is more supportive of faculty in their teaching and research;
- Holding promise for addressing issues of societal interest so as to lead to the betterment of the world's peoples, both locally and globally.

In summary this means that any new organizational arrangement should be attractive to students, encourage faculty collaboration in teaching and research, and contribute to meeting the University's societal responsibilities.

Working Group 3's Report went on to identify six qualities that any initiative would need to possess in order to succeed.

- 1) Offer outstanding quality to attract faculty and students.
- 2) Integrate theoretical, critical, and applied perspectives.
- 3) Be adaptable and support development of emerging areas of scholarship, research, and teaching.
- 4) Not be a copy of other Canadian institutions.
- 5) Embrace a broad definition of "environment" and encourage interdisciplinarity.
- 6) Build upon the existing diverse strengths of Simon Fraser University faculty.

⁵ The report is available at http://www.sfu.ca/vpacademic/files/WG_3_finalreport.pdf.

⁶ Throughout this report, "department" includes Departments, Schools, and Programs.

Avoiding arrangements that would interfere with the development of these qualities should be a paramount objective but most of them could only be achieved after a new organizational unit had been created.

The Report recommended that a facilitator be appointed to conduct a visioning process to clarify the thematic foci and major programmatic and research areas of a potential environmental initiative for Simon Fraser University. This thematic visioning process was to include a self-study of the activities and interests of existing faculty at the University based on consultation with the broadest possible array of faculty engaged in research and education in the environment, development and sustainability at the University.

After a short period of initial consultation, a draft facilitator's report⁷ was distributed in late September. This was followed by a series of meetings⁸ with interested faculty and others, a one-day Environment Visioning Workshop⁹ with invited participation from 16 faculty members on October 26, and an open forum attended by about 60 persons on November 1. This final report has benefited enormously from the input received in all these interactions. It is important to note that this report aims to reflect actual statements made by participants in all parts of the consultative process. The report is a summary of opinions and arguments, not a statement of consensus.

The main sections of this report are developed as follows.

- A. Comprehensive Review of Current SFU's Environment And Sustainability Activities
- B. Scan of Environmental Programs at Other Canadian Universities
- C. A New Environmental Programming Vision for SFU
- D. Review of Organizational Options for SFU

A. CURRENT ENVIRONMENT AND SUSTAINABILITY ACTIVITIES AT SFU

SFU has been addressing environmental problems from its earliest years. Very early thinking about the departmental composition of SFU included an environmental science department¹⁰ but this was not included in the initial 1965 departments. The 1967 pest management program in the

⁷ <http://www.sfu.ca/vpacademic/files/enviro.report.doc>

⁸ Before and after completion of the draft report a total of 20 meetings were held with about 60 persons interested in environmental programming.

⁹ The Environment Visioning Workshop Report is available at http://www.sfu.ca/vpacademic/files/Report_on_Environment_Visioning_Workshop.doc

¹⁰ Hugh Johnston, *Radical Campus: Making Simon Fraser University*, Vancouver, Douglas & McIntyre, 2005, 84.

Department of Biological Sciences with its emphasis on biological control of agricultural and forest pests was the first tangible example of this early interest¹¹. In 1979 what is now the School of Resource and Environmental Management offered its first courses and in the same year SFU developed and approved an undergraduate resource management program to be located in Kelowna but government approval was not forthcoming. Across many departments, SFU's environmental programming and research activities have greatly expanded over the decades.

This section contains a summary of faculty, departmental, and University interests and activities related to the environment and sustainability. It is likely that the information in this section has not captured all aspects of these interests.

1. Interests of faculty members. A recent tabulation using faculty websites identified 68 faculty members in 18 faculties and departments with "environment" as an interest. The largest number of environmentally-oriented faculty were in Geography, with Biological Sciences second. A search of the "SFU Researchers Database" for keywords "environment", "environmental", and "sustainable" produced 48 names but this source is dated (several names are no longer at SFU) and incomplete. It seems likely that there are at least 70 faculty members whose scholarly interests fall at least in part within the general ambit of "environment".

2. Interests of Departments. The following listing identifies departments with various levels of environmental interest as shown by either their participation by written submission in the Working Group 3 (WG3) process or their programming.

A. Participation in WG3 (The 2006 number of appointed CFL faculty members¹² is shown in brackets.)

Earth Sciences (15)

Environmental Science

Geography (26)

Graduate Certificate in Development

Resource and Environmental Management (14)

Sustainable Community Development (1)

Urban Studies (3)

B. Environmental Programming at the Degree Level, Including Minors (and not included above)

Biological Sciences

Chemistry

¹¹ Johnston, 2005, 204-205.

¹² http://www.sfu.ca/irp/faculty_staff/documents/f02.xls

Education

Statistics and Actuarial Science

C. Environmental Programming at the Course Level (and not included above)¹³

Archaeology	History
Business Administration	Humanities
Communication	Marine Science
Economics	Physics
First Nations Studies	Sociology and Anthropology
Health Sciences	Women's Studies

3. Degrees and Enrollments

Employment in environmental occupations is over 3 percent of total Canadian employment¹⁴ while environmental degrees apparently account for only about 1.5 percent of total undergraduate degrees. A sizeable proportion of environmental workers have university degrees and most are interested in continuing professional education. These statistics and the general interest in environment and sustainability would seem to point to a substantial demand, at least hypothetically, for university environmental programming.¹⁵

Actual student interest in environmental programming can be measured in a variety of ways. One way would be to conduct a survey of student interest in a particular actual or potential program opportunity. This has not been done for environmental programming at SFU. Student interest can also be assessed by examining degrees granted, majoring students, and course enrollments. The following tables present this type of information for SFU over the last five years. Note that this will obviously understate student interest in environmental courses because the student interest represented in Group 2.C. departments is not included. The exclusion of Ph.D.-level information here and elsewhere in this report is not meant to imply that these programs are unimportant but they almost always grow out of other initiatives.

¹³ Other departments including the Canadian Studies Program, the Centre for Dialogue, the Department of English, and the Public Policy Program offer environmentally-related courses but do so under generic course titles and descriptions.

¹⁴ ECO (Environmental Career Organization) Canada's most recent environment employer survey reports that in 2006 there were 530,000 environmental workers in Canada (93,000 in B.C.) employed in over 100,000 establishments. Employment was estimated to have increased by 2.3 percent annually over the preceding 5 years, faster than the rate of growth in total employment.

http://www.eco.ca/pdf/LMI_Industry_Final_2007_EN.pdf

¹⁵ http://www.eco.ca/pdf/LMI_Practitioner_Final_2006_EN.pdf

Table 1
Degrees Granted in Environmental Programs, 2002/03-2006/07

<u>Undergraduate Honours and Majors</u>	2002/03	2003/04	2004/05	2005/06	2006/07	Average*
B.Sc. Environmental Science	20	23	13	13	15	17
B.A. Geography - Environmental	12	11	18	24	14	16
B.Sc. Earth Sciences	8	8	7	8	11	8
B.Sc. Geography	12	13	17	8	5	11
Total Above	52	55	55	53	45	52
Total Undergraduate	2913	3127	3204	3488	3623	3271
Percentage Above of Undergraduate	1.79%	1.76%	1.72%	1.52%	1.54%	1.59%
<u>Undergraduate Minors</u>						
Environmental Chemistry	1	2	5	3	4	3
Environmental Education	14	8	44	31	14	22
Environmental Toxicology	6	8	2	4	1	4
Total Above	21	18	50	38	19	29
<u>Master's</u>						
MRM	28	34	14	14	21	22
MRM (Planning)			2	6	5	4
M.Sc., Earth Sciences	7	12	5	7	9	8
M.Sc., Geography	2	5	3	9	4	5
M.URB.					9	9
MET	5	7	5	4	1	4
MPM	8	4	4		2	4
Total Above	50	62	33	40	51	56
Total Master's	594	681	650	587	768	656
Percentage Above of Master's	8.42%	9.10%	5.08%	6.81%	6.64%	8.50%

* Based on number of years specific programs were available so totals are slightly distorted.

Sources: SFU Analytical Studies Tables D37-b, D-33, and D-36.

In addition to the degrees shown above, a few departments have issued certificates and diplomas in environmentally-related programs. These total an annual average of about 30 over this five-year period, 70 percent of them in Sustainable Community Development.

Another measure of undergraduate student interest is declared majors. This information is shown in Table 2.

Table 2
Declared Majors, Fall Semesters, 2002-2006

	Fall 02	Fall 03	Fall 04	Fall 05	Fall 06	Average
Environmental Science	47	47	39	42	68	49
Geography - Environment	56	67	71	50	47	58
Earth Sciences	25	37	38	41	52	39
B.Sc. Geography	51	45	32	25	27	36
Total Above	179	196	180	158	194	181
Total All Majors	10238	11013	11580	12086	13184	11620
Percentage Above of Total	1.75%	1.78%	1.55%	1.31%	1.47%	1.56%

Source: SFU Analytical Studies, Table D4-b.

Finally, there are three groups of undergraduate courses with a special environmental orientation. Some of these courses likely have a service course role. Aggregate enrollments (not EETs) for these courses (the list excludes directed readings and project courses) are shown in Table 3.

4. External Reviews

Recent external reviews of the four departmental units listed in 2.A. are available. They provide some assessment of the environmental capabilities and activities of these four units.

The Department of Earth Sciences review (2004) noted the original Earth Sciences mandate to focus on Environmental Geoscience and the need to also deliver a program that allowed graduates to become registered geoscientists. Concern was expressed over undergraduate enrollment levels. The reviewers recommended that the principal research mandate of Earth Sciences should remain Environmental Geoscience. Overall, the review was positive concerning the progress and potential of Earth Sciences.

Table 3
Course Enrollments, 2002-2007*

	2002/03	2003/04	2004/05	2005/06	2006/07
Environmental Science (EVSC 200, 401, 491)	93	81	105	104	86
Resource and Environmental Management (REM 100, 311, 356, 412, 445, 471)	315	301	327	342	362
Sustainable Community Development (SCD 201, 301, 401, 403, 410)	247	215	218	209	210
Total	1779	1629	1740	1757	1802

* These are three-semester years beginning in the fall semester and ending in the following summer semester. Source: Analytical Studies Course Section Enrollment Database.

The external review of the Environmental Science Program (2006) said that the Program had previously experienced less administrative support than it needed and that it lacked visibility. The reviewers noted many deficiencies in the current curriculum (leading to a declining number of students and their concentration in only two of the six streams) and recommended a complete restructuring (“... the status quo is not an option”). They also recommended that Environmental Science become a Department and said that SFU should strengthen its environmental profile by creating a Faculty of the Environment.

According to the Department of Geography (2006) external review, the Department needed to increase the number of faculty members in physical geography¹⁶. Most of the review concentrated on matters that are not germane to this report but there was concern about course scheduling problems for Geography-Environmental students and about lack of participation by Geography faculty members in cross-disciplinary research initiatives.

The external review of the School of Resource and Environmental Management (2003) was very positive about the faculty and teaching programs. However, the reviewers did observe that the School is not very visible on campus and that it should publicize its successes more actively. The reviewers said that there should be no change in the number of undergraduate courses.

5. Research

SFU's environmentally-related research has considerable breadth and depth. There are several ways of illustrating this. “Environment” is one of the five research themes in SFU's current Strategic Research Plan, 2005-2010¹⁷. This theme is described as follows:

SFU has an excellent record of high-profile research related to the environment. This research is conducted throughout the University, and the research approaches

¹⁶ A number of new physical geography faculty have been appointed since the review.

¹⁷ http://www.sfu.ca/vpresearch/srp_final.pdf

used and topics studied span a range of sectors from theoretical and mechanistic studies to applied management strategies. Mirroring the major natural resources of British Columbia, research clusters at SFU focus on the relationships between economic development, conservation and biodiversity in terrestrial and aquatic ecosystems, as well as on natural hazard prediction and prevention. Our research includes not only chemical, molecular biological, toxicological, physiological, and behavioural studies, but also risk assessment, management, and historic and economic considerations. The ultimate goal of this multifaceted approach is to provide a sound basis for sustainable development and the responsible use of our natural resources.

Three research areas in this theme are given special mention - Fisheries and Aquatic Ecosystems, Forestry and Terrestrial Ecosystems, and Local Impacts of Human and Natural Disturbances.

Eleven of SFU's 64 research centres and institutes have at least a partial environmental orientation¹⁸. These centres and institutes are listed below.

- Behavioural Ecology Research Group
- Centre for Coastal Studies
- Centre for Natural Hazards Research
- Centre for Sustainable Community Development
- Centre for Tourism Policy and Research
- Centre for Wildlife Ecology
- Chemical Ecology Research Group
- Cooperative Resource Management Institute
- Imaginative Education Research Group
- Institute for the Humanities
- Western Canadian Universities Marine Sciences Society

While not all research at SFU occurs within research centres and institutes, this list does demonstrate considerable interest in a wide range of environmentally-related research topics.

Another indicator of research interest and capability is that five of the University's 32 Canada Research Chairs (as of June 30, 2006) are in environmental areas¹⁹. Also, SFU's first B.C. Leading

¹⁸ <http://www.sfu.ca/vpresearch/centres.html>

¹⁹ http://www.sfu.ca/vpresearch/RM_package/CRCs%20June2006.pdf

Edge Endowment Fund Chair is in an environmental area and another fully endowed Chair in Coastal Studies has just been approved.

The record of research funding²⁰ is another source of information but the record of research grants and contracts at the level of the individual faculty member is not easy to aggregate and the record by department may not capture all funding for environmental research. The four departments that participated in the WG3 process had the following levels of research grant and contract funding in 2005/06.

Earth Sciences - \$1.2 million

Geography - \$1.3 million

Resource and Environmental Management - \$2.2 million

Urban Studies - \$0.2 million

This totals \$4.9 million (8 percent) out of an SFU 2005/06 total of \$62.0 million. This is a larger amount per faculty member²¹ in these units (\$85,000) than the SFU average per faculty member (\$72,000).

However, SFU does not have a research unit that includes a broad range of environmental and sustainability topics. Recently, there has been a surge in government funding interest in strategic inter-university environmental research projects. Examples include the Pacific Green Energy Initiative, a potentially large research consortium based on the BC government's energy objectives and another BC government research initiative on climate change solutions. Although a research Center for Environmental Sustainability has reached the framework stage, there is no unit at SFU with the collaborative and integrative strength of, for example, the University of Calgary's Institute for Sustainable Energy, Environment, and Economy²². Without such a unit, organizing and delivering SFU participation in complex environmental research networks may be difficult.

6. Outreach

The first words in SFU's most recent annual President's Report are "At Simon Fraser University, we think good ideas should get out and travel"²³. Outreach involves tailored combinations of research and teaching expertise that take the University outside its traditional campus setting. SFU has a number of successful outreach initiatives that involve taking SFU research and policy expertise in the environment and sustainability into a variety of local, national, and global settings. Four

²⁰ Information on research grants and contracts for 2005/06 is available at <http://www.sfu.ca/ors/stats/srcdist200506.pdf>.

²¹ The year of funding ends five months earlier than the faculty count.

²² Information is available at <http://www.iseee.ca/iseee/>

²³ <http://www.sfu.ca/report2006/index.html>

examples of many are outlined below.

a. The recent Adaptation to Climate Change Team (ACT) led by the Public Policy Program will study eight key climate change-related areas and consider ways to protect Canadian environmental, economic and social wellbeing throughout its four-year program. Working in conjunction with leading experts, and tapping into the expertise of SFU's own researchers, ACT will study the problems posed as well as potential solutions, and produce policy recommendations for adaptation.²⁴ SFU is partnering with the insurance company Zurich Canada in this program.

b. Since 1992 SFU has provided the Canadian secretariat office for the China Council for International Development and Cooperation (CCICED). The purpose of the Council is to further strengthen cooperation and exchange between China and the international community in the field of environment and development. CCICED has high level representation from China, Canada, and a number of other countries. It is a high-level advisory body of the Chinese Government and is mandated to exchange and disseminate international experience and expertise in the field of environment and development, to carry out in-depth research on key issues related to China's environment and development, to provide policy recommendations to the Chinese Government, and to conduct policy demonstrations as necessary, with a view to integrating environment and development and ensuring the sustainability of economic development in China.²⁵ Most of the funding for CCICED comes from CIDA, the Canadian International Development Agency and for Phase IV, 2007-2011, totals almost \$7 million. In Phase IV it is expected that direct SFU involvement in the work of CCICED will increase.

c. One of SFU's environmentally-oriented research centres, the Centre for Coastal Studies²⁶, has a mandate to promote interdisciplinary research, education and dialogue on Canada's coastal ecosystems, particularly those in British Columbia. Its outreach programs are done in collaboration with the Science Programs unit of Continuing Studies. By linking social and natural science with local knowledge, the Centre focuses on three key themes:

1. Marine conservation
2. Sustainable coastal communities and economies
3. Building resource management capacity (government, community, academic)

²⁴ See <http://www.sfu.ca/act/> for information.

²⁵ CCICED's website is <http://eng.cciced.org/cn/company/create/page2102.htm?siteid=1&lmid=2102>.

²⁶ <http://www.sfu.ca/coastalstudies/index.htm>

It also coordinates the Linking Science with Local Knowledge node of the DFO/SSHRC national Ocean Management Research Network. If website hits (8,000 per week in 2006/07²⁷) are any indication, the Centre's outreach and research activities are highly valued by its external communities.

d. SFU's Faculty of Education is home to Canada's oldest, most established (for 37 years) Summer Institute in Environmental Education. The Institute provides teachers and other educators with an opportunity to consider and explore the educational opportunities and implications of human-environment interactions. It is inter-disciplinary in nature and considers the environment through the perspectives of the natural and social sciences, humanities, economics, and the arts. It also addresses curriculums and educational programming from K-Adult levels. Institute formats provide for a wide range of field experiences, seminars, lectures, volunteer opportunities, and hands on activities.²⁸ SFU Education faculty members have led a recent project for a new environmental education guide for teachers²⁹ and teach in a variety of environmentally-oriented programs for educators.

While the importance of SFU carrying out environmentally-focused outreach and networking programs was mentioned quite frequently in the consultations leading up to this report, it appeared that these examples were not as well known as they should be. Even with the fairly large number of activities that are underway now, SFU could do more to meet society's interests and needs for environmental and sustainability outreach.

7. Sustainability Profile

Many North American universities have established sustainability policies and offices in the last few years. The Association of University Leaders for a Sustainable Future (ULSF), a product of the Talloires Declaration³⁰, has been in existence for over 15 years and recently over 400 U.S. university and college presidents have signed the Presidents Climate Commitment³¹ to reduce greenhouse gas emissions and support other measures to slow climate change.

Despite being a signatory to the Talloires Declaration on university sustainability, SFU has yet to create a public profile as a sustainable campus. This is in marked contrast with some other Canadian universities, notably UBC, which has a detailed Sustainability Strategy³² and a high-profile

²⁷ Statistics supplied by the Centre for Coastal Studies for its own website and the associated website of Continuing Studies in Science.

²⁸ <http://www.educ.sfu.ca/ee/>

²⁹ http://www.bced.gov.bc.ca/environment_ed/welcome.htm

³⁰ http://www.ulsf.org/programs_talloires.html

³¹ <http://www.presidentsclimatecommitment.org/html/commitment.php>

³² http://www.sustain.ubc.ca/pdfs/ia/51059_iatarg_april3_rv2.pdf

Sustainability Office³³. However, SFU now has a meaningful sustainability policy at the final draft stage³⁴ and the UniverCity project³⁵ has received numerous awards for design sustainability.

8. Summary of SFU Capabilities and Activities

What do the preceding sections tell us about SFU's environmental capabilities and activities?

Departments and Faculty Members. There is a widespread interest in environmental topics. The large number of departments with some environmental courses suggests that there could be opportunities for faculty and program collaboration that are not being realized. Research has shown that mission, network, and structures are important elements in encouraging faculty collaboration.³⁶

Students. Many measures of student interest in environmental programs show relative decline or, at best, stability. Given the interest in the environment and the increased employment in the environment industry and government, this seems to run counter to the expected impact of employment opportunities on student interest in specialized programs. This discrepancy between enrollment and employment may indicate defects in the design and delivery of environment-related programs. The impetus and inspiration for program re-design should come from inside the University but the information provided by the Canadian Environmental Careers Accreditation Bureau³⁷ would be of some value in considering how to re-design environmental programs.

Research. Admittedly crude data show that environmental research obtains funding above the University-wide average. The inclusion of "Environment" as one of five themes in the current Strategic Research Plan appears to be well-founded.

Outreach. SFU does more environmental outreach than is generally recognized but, based on the level of public interest and the success of SFU's current outreach activities, much more could be done to reach government, schools, industry, and the general public.

³³ A recent assessment of UBC's sustainability profile says this: "A leader in the greening of Canadian campuses, UBC adopted a sustainable development policy in 1997 and a year later opened a campus Sustainability Office -- both firsts for the nation's colleges. Offering more than 300 sustainability-related courses, this Vancouver campus was Canada's first and only university to receive Campus Ecology Recognition from the U.S.-based National Wildlife Federation, in 2003 and again in 2005. And just last year, UBC developed a comprehensive sustainability strategy to keep the eco-momentum moving." http://www.grist.org/news/maindish/2007/08/10/colleges/?source=most_popular. Another positive view is available at <http://www.worldwatch.org/node/4539>.

³⁴ [http://www.sfu.ca/policies/files/Draft_Policy_Pages/GP38 - SFU Sustainability Policy draft 0.7.pdf](http://www.sfu.ca/policies/files/Draft_Policy_Pages/GP38_-_SFU_Sustainability_Policy_draft_0.7.pdf)

³⁵ <http://www.university.ca/>

³⁶ Adrianna Kezar (2006), "Redesigning For Collaboration in Learning Initiatives: An Examination of Four Highly Collaborative Campuses", *The Journal of Higher Education*, 77 (5), 804-838.

³⁷ http://www.cecab.org/documents/NOS_Profiles_UL.pdf

B. ENVIRONMENT AND SUSTAINABILITY AT OTHER CANADIAN UNIVERSITIES

This section surveys environmental and sustainability programs at other Canadian universities. Every Canadian university offers some kind of environmental programming and a variety of environmentally-oriented courses. This section only includes universities with at least comparable activity to SFU. It will pay particular attention to other British Columbia universities.

University of British Columbia

UBC has a sizeable array of organizationally scattered environmental programs. At the undergraduate level these include (average annual number of degrees granted in brackets³⁸):

- Two Faculties offering applied natural resource programming - Forestry (31) and Land and Food Systems (58³⁹)
- Departments of Geography and Earth and Ocean Sciences (13)
- Environmental Sciences (14)
- Environmental Engineering (new program - joint with UNBC)
- Environmental Design (15 - one year)
- Ecology and Environmental Biology (N/A)

Graduate Master's programs in environment include:

- Two Faculties offering applied natural resource programming - Forestry (27) and Land and Food Systems (12)
- School of Community and Regional Planning (33)
- Institute for Resource Management and Environmental Studies (11)

UBC-Okanagan has a Department of Chemistry, Earth & Environmental Sciences that offers BSc degrees in Earth and Environmental Sciences, Environmental Chemistry, and Freshwater Science.

UBC is over twice as large as SFU and its roughly similar scale of environmental programming means that it is slightly less intensive than SFU in this field. Environmental research at UBC is generally departmentally-based, but there are several research centres and institutes, notably the Sustainable Development Research Initiative and the Biodiversity Research Centre. The high-profile Centre for Interactive Research on Sustainability (CIRS) has substantial involvement of SFU faculty.⁴⁰

³⁸ <http://www.pair.ubc.ca/student/prog.htm>.

³⁹ Excludes food, nutrition, and health degrees.

⁴⁰ <http://www.cirs.ubc.ca/>

This year UBC established the College for Interdisciplinary Studies, now the academic home for several environmental teaching and research units.⁴¹ A UBC Senate motion says that the mandate of the College will be to facilitate and support interdisciplinarity campus-wide and to serve as a place for the creation, development, and dissemination of new and important scholarly activities according to UBC's strategic vision. This vision includes the statement that UBC will "promote the values of a civil and sustainable society". The mechanisms for facilitating campus-wide interdisciplinarity are apparently still under development.

University of Victoria

The most notable organizational feature of UVic's environmental profile is its School of the Environment, established in 1997. The School is located in the Faculty of Social Sciences and succeeds an earlier Environmental Studies Program that began in 1974. The School has a large undergraduate Environmental Studies Program that offers an "Environmental" degree notation when the School's curriculum is combined with another major or honours program (B.A. or B.Sc.).⁴² The School has taught an average 134 EETs per year over the last five years.⁴³ A new graduate program has recently been introduced. UVic also has environmental programming in the School of Earth and Ocean Sciences (8 undergraduate and 9 Master's⁴⁴) and the Department of Geography (80 B.Sc. and 7 M.Sc.). Overall, UVic's environmental programming is roughly similar in size to SFU's but has more undergraduate emphasis.

University of Northern B.C.

UNBC has probably the most complete set of environmental programs of any Canadian university. They are all located in the College of Science and Management. The departmental units include:

- Chemistry, Environmental Science (BSc) and Environmental Engineering (BASc)⁴⁵
- Ecosystem Science and Management - Natural Resources Management-Forestry (BSc);
Natural Resources Management - Wildlife and Fisheries (BSc); Environmental Studies (BA)
- Geography (BSc)
- Planning (BPl)

Some of these programs also offer graduate degrees. Statistical information on program size is not available in UNBC's statistical publication.⁴⁶ However, UNBC is a 4,000-headcount university and none of these programs will be very large.

⁴¹ See <http://www.cfis.ubc.ca/>.

⁴² See <http://web.uvic.ca/calendar2007/FACS/FoSoS/SoEnS/ESPr.html>. The School also offers an Environmental Studies double major but there have not been any degrees granted of this type in the last two years.

⁴³ http://www.inst.uvic.ca/enrolment/table4a/er_table4a.pdf

⁴⁴ Annual averages: http://www.inst.uvic.ca/factbook/fb_table26.pdf

⁴⁵ Joint with UBC; first two years and last term at UNBC.

⁴⁶ <http://www.unbc.ca/about/guide/index.html>

Royal Roads University

RRU has a School of Environment and Sustainability in its Faculty of Social and Applied Sciences. Undergraduate BSc degrees in Environmental Science and Environmental Management are offered along with Master's degrees in Environment and Management and in Environmental Education and Communication. RRU enrollment information is not program-specific but total FTE enrollment is under 2,000. RRU is also home to the Canadian Centre for Environmental Education (CCEE) which offers education, training, professional development and accreditation for members of the environmental professions. The CCEE is a partnership between Royal Roads University and the Environmental Careers Organization of Canada.

Other Canadian Universities

The Working Group 3 Report included information on environmental programming and organization at a number of Canadian universities. Table 4 (next page) expands their sample and focuses on the organizational structure and teaching programs of other universities' environmental programming. Only universities offering environmental programs with specific university-level environmental units are included.⁴⁷

Most of the universities included in this section have institutionally more prominent environmental units than SFU. Some have re-organized around environmental themes quite recently or are in the process of doing so. Some of these reorganizations have involved the relocation of existing environmentally-related departments, but not all have done this. It was not possible to assess the success of these various arrangements.

Compared to SFU, most of these universities have more environmental degree programs and seem to have established better integration with related departments in their university. Overall, most offer a larger number of environmental courses that provide a fuller coverage of scientific and applied perspectives. However, enrollments are not large anywhere and, despite increased public interest in environmental subjects, do not seem to be growing, especially at the undergraduate level. Nevertheless, most of these universities are graduating more undergraduate students in environmental programs than SFU and many of these programs offer a more comprehensive exposure to environmental topics.

⁴⁷ The sources for this information are various university websites. URLs are available from the author.

Table 4
Environmental Organization at Selected Canadian Universities

University	Environmental Faculty or Equivalent	Components	Undergraduate and Master's Degree Programs	Size (average annual graduates last five years)
Alberta	Faculty of Agriculture, Forestry and Home Economics	Department of Renewable Resources	BSc, Environmental and Conservation Sciences; MSc	N/A
Calgary	Faculty of Environmental Design		MEDes, Environmental Science	14
Dalhousie	Faculty of Management	School for Resource and Environmental Studies	Master of Environmental Studies (MES), Master of Resource and Environmental Management (MREM).	N/A
Guelph	Ontario Agricultural College	Faculty of Environmental Sciences; School of Environmental Design and Rural Development	BSc, Environmental Sciences; MSc, Rural Planning and Development	N/A
Manitoba	Clayton H. Riddell Faculty of Environment, Earth, and Resources	Department of Environment & Geography; Department of Geological Sciences; Natural Resources Institute	BSc., Physical Geography, Bachelor of Environmental Sciences, Bachelor of Environmental Studies, Master of Environmental Science, Master of Environment; BSc, Geological Sciences, MSc, Geological Sciences; Master of Natural Resources Management	78 UG; 23 G (2005)
McGill	McGill School of Environment	(17 faculty jointly appointed with other units)	BA, Environment, BSc, Environment; Graduate Environment Option	N/A
Queen's	Faculty of Arts and Science	School of Environmental Studies	BSc, Environmental Science, Master of Environmental Studies	N/A
Saskatchewan	School of Environment and Sustainability (proposed)		Master of Environment, Master of Applied Environmental Processes, M.A. or M.Sc. programs on environmental themes (proposed)	
Toronto	Faculty of Arts and Science	Centre for Environment	Collaborative master's programs, Master of Environmental Science; Collaborative undergraduate programs in environment and science, environmental policy and practice, and environment and society	N/A (began in 2005)
Waterloo	Faculty of Environmental Studies	Department of Environment and Resource Studies, Department of Geography, School of Planning	Bachelor of Environmental Studies; MA, Planning; Master of Environmental Studies; Master of Applied Environmental Studies and others	230 UG; 52 G
York	Faculty of Environmental Studies		Bachelor in Environmental Studies; Master in Environmental Studies	65 UG; 107 G

C. A NEW ENVIRONMENTAL PROGRAMMING VISION FOR SFU

This section outlines the views on environmental programming at SFU offered during the various consultation opportunities leading up to the completion of this report. There were many different interests and priorities revealed during this process but there was a strong consensus for SFU undertaking a significant environmental programming initiative at this time. The confluence of major academic restructuring in parts of the University at the same time as greatly expanded interest in environmental issues among governments, funding agencies, potential donors, and society as a whole offers a unique opportunity, in the view of most consultation participants.

Scope of Environmental Programming

Environmental program units at most universities concentrate on the relationships between natural environment and the other aspects of the human environment. This means that outcomes such as “sustainability” are defined in terms of the natural environment. Some participants were concerned that this approach might lead to insufficient importance being given to social and policy aspects of environmental teaching and research. The opinion of most was that an environmental initiative at SFU should embody the elements of “environment” and “sustainability” but not “development”. “Development” within the context of environment and sustainability was also seen as important but most opinion was that the concept of sustainability captures the issues of development without invoking the latter term’s broad application to other areas.

There was wide agreement that an environmental initiative must bring together the humanities, natural, applied, and social sciences in an integrated multi- and inter-disciplinary strategy. What is needed, in the view of many, is a unit that could function effectively as a synergizer of the various environmental interests and capabilities at SFU. While most supported a Faculty of the Environment and Sustainability (FES)⁴⁸ rather than an environmental and sustainability institute, even of a new type, there was a minority opinion that many of the identified integration and collaboration needs could be addressed just as effectively by an institute with special powers to appoint faculty and offer courses.

The Visioning Workshop participants accepted the following as important principles for a multi-disciplinary environmental initiative:

1. Graduate versatile students
2. Maintain respect for each other’s disciplines

⁴⁸ This title will be used in the remaining sections of this report but the name of a new Faculty is less important than its mission and structure.

3. Show commitment to students and interdisciplinary teaching
4. Be open to participating in integrative research
5. Be involved with British Columbia and Canadian environmental issues but maintain a global perspective and address environmental problems in other countries.

Approaches to Undergraduate Program Development

Workshop participants noted that one of the key opportunities for an environmental initiative at SFU was the improvement and expansion of undergraduate education. There was considerable discussion of how to improve undergraduate environmental programming and develop new programs and approaches to teaching. Various shortcomings of SFU's existing undergraduate environmental programs were mentioned. The following were offered as undergraduate program suggestions as part of a new environmental initiative.

General Objectives

- While there was some sentiment in favour of programming focused on elite students it was recognized that environmental programs must also be accessible to the general undergraduate student body.
- Improve current environmental programs which do not seem to be able to flourish in their current settings and structures.
- Programs should not be overly prescriptive and must allow sufficient elective choice for students.
- The University's undergraduate environmental programs should have components that lead to an environmental degree as well as components that develop an environmental competence to accompany discipline-based majors. Where appropriate, professional certification should be facilitated.

Program Features

- Create cohort-based degree programs that include a range of degree types ranging from B.Sc., through "B.Env." to B.A.
- Create some courses that would be multidisciplinary and might use team teaching. A capstone course of the "How to Improve the World" type should be included.
- Create a non-degree cohort-based program that would consist perhaps of one course per year where students would engage in seminar style discussions around the "big issues" of

the environment such as global warming, climate change, etc. Could consider recognizing this activity through an “environment” designation added to discipline-based degrees.

- Collaboration with other institutions would be helpful for some program specialties (an example of a collaboration with BCIT was identified).
- The following were suggested as course and/or concentration areas: Environmental Health, Conservation and Wildlife Management, Toxicology, Water Resources, Environmental Literature, Climate Change, Geographical Information Science.
- Development of human and social skills of students should be encouraged and incorporated into course content wherever possible.
- Experiential learning opportunities through field work, student internships and the Co-op Program were considered to be highly desirable.

Future Development

- There was considerable discussion concerning the desirability and feasibility of adding an environmental literacy requirement for all undergraduate students.⁴⁹ This was generally supported, but it was recognized that serious consideration of this idea would have to wait until the new W, Q, B requirements had been fully introduced.
- SFU should consider developing programming with partner institutions around the world. This would provide students with an unparalleled education and understanding of environment and sustainability issues worldwide and serve SFU's commitment to internationalization objectives. Joint programming, field schools, international exchange programs, were a few of the examples provided for such an approach. This would give SFU a larger profile and presence than could be achieved through local talent and resources.

Approaches to Graduate Program Development

There was relatively little discussion of graduate programming. Some participants thought that new graduate programming would naturally follow from the formation of an FES and that existing graduate programming in the area of the environment would be improved.

⁴⁹ For a positive evaluation of a similar requirement at the University of Georgia see Gwyneth L. Moody and Peter G. Hartel (2006), “Evaluating an Environmental Literacy Requirement Chosen as a Method to produce Environmentally Literate University Students,” *International Journal of Sustainability in Higher Education*, 8, pp. 355-370.

The shortage of capacity in the MRM program was noted (only 15-20% of applicants accepted). A new environmental science graduate program was suggested as a desirable addition in a new environmental initiative. The potential development of a new multi-institutional Master's program in Sustainability Leadership at the Great Northern Way campus was also noted.

Research Opportunities

Participants agreed that there were now many opportunities for large scale research projects and programs involving researchers at many institutions and that having a central environmental unit at SFU would help SFU's opportunities for participation. However, most participants felt that environmental research collaboration among SFU faculty had not been significantly hindered by lack of a central environmental unit. This opinion may lack personal experience with the collaboration advantages conferred by a common organizational unit.

Outreach and Policy Impact

Participants believed that this was important and that the new initiative should strive to reach and serve the public and private sectors, including non-traditional groups such as indigenous communities. This should be an important objective in the mission of any new environmental unit.

Organizational Issues

In virtually all consultation events there was great interest in discussing organizational options and considering the many organizational issues that might confront a new environmental initiative. It will be important to have a manageable scope for programs and research collaborations and to ensure that various synergies are likely to be productive rather than diversionary.

Many participants said that SFU's current department-oriented academic structure created barriers⁵⁰, especially across Faculties, but there was a certain skepticism about a new FES eliminating these barriers unless this was an explicit objective built into the Faculty itself and facilitated by changes in University-level policy and practice. These changes should address, for example, the problems posed by departmental pre-occupation with enrollment levels and discouragement of departmental faculty from undertaking extra-departmental activities. A central university official with funding to finance secondment of faculty to interdisciplinary initiatives was suggested.

⁵⁰ Others referred to these restrictions less pejoratively as "boundaries" and argued the advantage of departmental boundaries in avoiding duplication and ensuring recognition of discipline strengths and the advantages of discipline-based programs.

- Some participants proposed that initially a new FES could aim to have 20 faculty members drawn from existing SFU faculty including those whose existing units might move to FES plus 20 new faculty members appointed once new programs were in place and as enrollments and funding expanded. Later, suitable existing units and other suitable individuals from existing units could join FES. Other participants proposed that a new FES could aim to include all suitable existing units from its outset plus suitable environmentally-oriented faculty from other units.
- A planning ("greenhouse") committee of perhaps 10 faculty members was suggested as a good start for the new interdisciplinary parts of this initiative. This group would be responsible for creating a new organizational culture - it was noted that leadership in the phase would be critical to the success of an FES. The committee would be the strategic planning committee for new interdisciplinary programming that would guide its development, nourish these programs as they evolved, and represent these newly emerging areas within FES.
- Although a cautious and careful approach ("take time to do it right") was urged in building this new Faculty, several participants suggested that a strong, visible, and spectacular start would ensure that the institutional advantages of an environmental initiative were maximized. The importance of suitable, contiguous physical space was noted. Other participants felt that the opportunity to act was limited and, if SFU did not move now, it would have lost its opportunity and potential external sources of funding from private and public sectors would go to other universities who had moved more quickly.
- Participants envisaged five types of participation of faculty members in the environmental initiative: (1) all faculty members in an existing unit; (2) individual faculty members transferred on a permanent basis; (3) individual faculty members with joint appointments; (4) individual faculty members on part- or full-time secondment for a fixed period of 1, 3, or 5 years; and (5) affiliated (Associate Member) involvement. New faculty members could be placed in any one of these five categories.
- There was a general agreement that current joint appointment policies are unattractive, especially for junior faculty and that current ad hoc secondment procedures and practices should be codified in University policy.

D. REVIEW OF ORGANIZATIONAL OPTIONS FOR SFU

As mentioned earlier, four organizational options for a possible environmental initiative were identified for consideration by Working Group 3 of the Phase 2 Task Force on Academic Structure. Working Group 3 also said that any new organizational arrangement should be attractive to students, encourage faculty collaboration in teaching and research, and contribute to meeting the

University's societal responsibilities. The advantages and disadvantages of each of the identified options are discussed in this section with a focus on how well each would address SFU's current environmental programming opportunities and what risks might be associated with each. The discussion here is partly based on views expressed during the consultation process but also draws on SFU's earlier experiences with programming and organization.

1. Maintain the Status Quo

In this option the current academic organization of environmental units continues. Partly because of the effects of the consultation process of the last two months, there should be some evolution towards more collaboration among environmentally-oriented faculty and it is reasonable to expect that some revision of the Environmental Science program could occur without organizational change. Because of anticipated changes elsewhere, the School of Resource and Environmental Management would probably need a new Faculty home but that could be accomplished in a number of ways that would still look like the status quo for most. The advantages of the status quo option are that it would be easy to accomplish and its direct financial costs would be minimal. It would also leave intact the strong discipline-based environmental capabilities at SFU and would not risk damage to departments for whom other options (such as creation of a Faculty of Environment and Sustainability) are seen as threats. The disadvantage of the status quo is that it would be seen as doing nothing; this would be deeply disappointing to many environmental faculty and would appear to students and to SFU's external communities that the University was falling short of meeting its educational and societal responsibilities. SFU would lag farther behind other Canadian universities in its approaches to interdisciplinary teaching and research in environment and sustainability.

2. Establish an Institute for Environment and Sustainability

In discussions, this option has usually been presented with the additional modifier "new type". There appeared to be a variety of meanings to these words but they usually seemed to mean an institute that had faculty appointments and offered its own courses (and maybe programs) as well.⁵¹ The university's Centres and Institutes Policy (R40.01)⁵² defines centres and institutes as follows:

1.2 Centres are non-departmental academic or administrative units which are established for special purposes, of an ongoing nature, related to the goals of the University.

⁵¹ Actually, this would not be that new. The Institute for Health Research and Education (2000) was given these responsibilities.

http://www.sfu.ca/vpacademic/Academic_Planning/Health_Initiative/Final_Proposal.html

⁵² <http://www.sfu.ca/policies/research/r40-01.htm>

1.3 The purposes of centres encompass, but are not limited to, the following: to facilitate collaborative research, especially multi-disciplinary research; to undertake specific types of teaching or training programs; to facilitate multi-university initiatives, such as centres of excellence; and to provide specific types of services to the community.

This language would seem to allow an environmental institute to have faculty appointment and teaching functions as described above but in fact almost no centres and institutes have done more than promote faculty co-operation and involvement in research projects of common interest. A new Centres and Institutes Policy has been discussed but there is no information concerning how this policy would be different.

The advantage of the institute option is that it would create a unit committed to interdisciplinary work on the environment and sustainability and would be a low-key and non-threatening way of accomplishing this. Its disadvantage is that an environmental and sustainability institute could just be another research center or institute with little or no connection to the University's teaching programs. At the same time, there could be a risk of duplication of existing courses and programs. An institute would be seen by many as a timid choice in relation to the opportunities and needs articulated by many consultation participants.

3. Create a New School of Environment and Sustainability

Under this option the current School of Resource and Environmental Management would presumably be the core of a new School with a modified name and an expanded teaching role that went well beyond its current graduate programs and likely included some existing and/or new undergraduate programs. Other faculty members could join this new School under any of the methods described earlier in this report. A Faculty home for this new School would need to be found. The advantage of this option is that it would amount to a more significant and enabled response to the perceived opportunity for expanded research, teaching, and outreach. The disadvantage is that it would in effect attach a variety of interests and opportunities to a unit that might not be ready to see its current priorities and operation so drastically changed. Also, it could be seen as not amounting to much change in the status quo.

A second School-type option would be to create a new School of Environment and Sustainability while leaving the School of Resource and Environmental Management substantially as it is. While this would risk duplication of effort it would avoid some of the disadvantages of the other version of this option. However, there would then be two units to place in some Faculty where they might not fit very well.

4. Create a New Faculty of Environment and Sustainability

Creating a Faculty of Environment and Sustainability would be the strongest response to the current opportunity. This option had by no means universal support among consultation participants but it seemed to have majority support. Considering the greater voice that Faculties have had in the University, a Faculty of Environment and Sustainability would represent a considerable elevation in priority for its areas of interest. That, plus the ability to gather participation from across the University and to provide a good platform for program development and outreach would be the main advantages of such a Faculty. The three criteria proposed by Working Group 3 would be met - the new Faculty could be expected to attract students, encourage faculty collaboration⁵³, and address SFU's societal responsibilities. The disadvantages would be the costs, financial and administrative, of creating a new Faculty and possible difficulties in reaching suitable agreement on its priorities and programs.

E. CONCLUSION

Public and media interest in environment and sustainability and the emergence of uncertainty concerning environmental issues and the design and implementation of policies to address these issues is a call for universities to consider how to best use their substantial environmental capabilities. The other three research universities in BC are, in various ways, ahead of SFU in environment and sustainability programming despite proportionately similar capabilities. Although SFU has considerable strengths in the field of environment and sustainability, many universities across Canada seem to be doing more. The weight of opinion gathered in the consultation process leading to this report strongly supports SFU undertaking an environmental programming initiative now.

Most of the opinion in the consultation process supported the creation of a Faculty of Environment and Sustainability although there were many differences about how it should be structured. Four particular issues would need to be addressed as part of a decision to proceed in this way.

- 1) Agreement on a vision statement that set out the scope and purposes of the Faculty;
- 2) Decisions on whether any existing units should immediately be transferred to the Faculty;
- 3) Undertakings to review all existing environmental programs and undertake planning for new programs;

⁵³ Recall that structure and mission are two variables that have been found to promote collaboration. Kezar (2006).

- 4) Agreement on mechanisms to encourage effective participation by faculty members and students in the work of the new Faculty.

SFU could have a greater institutional presence from its 70-plus environmental faculty than it does now. The University could be educating more undergraduate and graduate students in environmental programs, participating in more inter-university collaborative research projects, benefiting from donor interest in giving to environmental endeavours, and providing more tangible evidence of participation in program activities that reflect public and governmental priorities. The three Vice-Presidents who are responsible for research, advancement, and government relations strongly support the view that a Faculty of Environment and Sustainability would be beneficial in these areas. It seems unlikely that SFU will secure many of these benefits with the organizational and programmatic status quo.

Appendix 2

Existing Environmental Programs at SFU

Founding FES Units (Environmental and Other):

Resource and Environmental Management

- Master's degree (MRM) in Resource Management
- Ph.D. in Resource and Environmental Management
- Graduate Diploma in Quantitative Methods in Fisheries Management

Environmental Science

- B.Sc. in Environmental Science - streams are Biology, Chemistry, Environmetrics, Physical Geography, Pollutant Transport, and Quantitative Techniques for Resource Management

Geography

- B.A. Geography – Environmental Specialty
- B.A. Geography – Environment and Resources stream
- B.Sc. Physical Geography
- Certificate in Spatial Information Systems
- M.A. Geography
- M.Sc. Geography
- Ph.D. Geography

Centre for Sustainable Community Development

- Undergraduate Certificate
- Post Baccalaureate Diploma
- Professional Certificate

Development Studies

- Certificate in Development Studies

Units outside FES:

Archaeology

- Cultural Resource Management (graduate specialization)

Biological Sciences

- Environmental Toxicology Minor

Chemistry

- Environmental Chemistry Minor

Earth Sciences

- B.Sc. Earth Science – Specialization in Environmental Geoscience
- M.Sc. Earth Science – Environmental Specialization

Appendix 3

Existing Environmental Courses at SFU

FES founding units

Unit	Course #	Course name	Already used in an environmental or sustainability program
EVSC	200-3	Intro to Environmental Science	*
EVSC	380-3	Practicum I	*
EVSC	381-3	Practicum II	*
EVSC	401-1	Current Topics in Environmental Science	*
EVSC	480-3	Practicum III	*
EVSC	481-3	Practicum IV	*
EVSC	482-3	Practicum V	*
EVSC	491W-3	Advanced Field Studies in Environmental Science	*
SCD	201-3	Intro to Sustainable Community Development	*
SCD	301-4	Sustainable Community Development Theory and Practice	*
SCD	401-4	Social Enterprise for Sustainable Community Development	*
SCD	403-4	Leadership in Sustainable Community Development	*
SCD	404-4	Project in Sustainable Community Development	*
SCD	410-4	Special Topics in Sustainable Community Development	*
SCD	412-4	Directed Studies in Sustainable Community Development	*
REM	100-3	Global Change	*
REM	311-3	Applied Ecology and Sustainable Environments	*
REM	356-3	Institutional Arrangements for Sustainable Environmental Management	*
REM	412-3	Environmental Modeling	*
REM	445-3	Environmental Risk Assessment	*
REM	471-3	Forest Ecosystem Management	*
REM	601-5	Social Science of Natural Resources Management	*
REM	602-5	Natural Resource Management II: Advanced Seminar	*
REM	609-5	Evaluation of Management Strategies for Living Resources	*
REM	310-5	Applied Environmental Toxicology and Environmental Management of Contaminants	*
REM	611-5	Population and Community	*
REM	612-5	Simulation Modelling in Natural Resource Management	*
REM	613-5	Methods in Fisheries Assessment	*

REM	614-5	Advanced Methods in Fisheries Assessment	*
REM	621-5	Ecological Economics	*
REM	625-5	Risk Assessment and Decision Analysis for Management of Natural	*
REM	631-5	Earth Systems and Global Change to Environmental Management	*
REM	632-5	Terrain Evaluation	*
REM	633-5	Introduction to Remote Sensing and Aerial Photographic Interpretation	*
REM	636-5	Applications of GIS in Resource and Environmental Management	*
REM	641-5	Law and Resources	*
REM	642-5	Regional Planning I	*
REM	643-5	Environmental Conflict and Dispute Resolution	*
REM	644-5	Public Policy Analysis and Administration	*
REM	645-5	Resource Development Communities	*
REM	646-5	Environmental and Social Impact Assessment and Environmental Management Systems	*
REM	647-5	Parks and Outdoor Recreation Planning	*
REM	648-5	The Tourism System	*
REM	649-5	Tourism Planning and Policy	*
REM	650-5	Energy and Materials Management and Policy	*
REM	651-5	Project Evaluation and Non-market Valuation Methods	*
REM	652-5	Community Tourism Planning and Development	*
REM	655-5	Water Planning and Management	*
REM	658-5	Energy and Materials Systems Modeling	*
REM	660-5	Special Topics in Natural Resources Management	*
REM	661-5	Special Topics in Resource Management	*
REM	662-5	Special Topics in Resource Management	*
REM	663-5	Special Topics in Resource Management	*
REM	664-5	Directed Studies	*
REM	670-5	Introduction to Forestry	*
REM	671-5	Forest Ecology	*
REM	672-5	Silviculture	*
REM	690-0	Practicum I	*
REM	691-0	Practicum II	*
REM	698-3	Field Resource Management Workshop	*
REM	699-10	Research Project	*
REM	801-5	Principles of Research Methods	*
REM	802-5	Research Approaches for REM PhD Students	*
REM	899-10	PhD Thesis	*
GEOG	100-3	Human Geography	*
GEOG	102-3	World Problems in Geographic Perspective	
GEOG	111-3	Physical Geography	*

GEOG	162-3	Canada	
GEOG	213-3	Geomorphology I	*
GEOG	214-3	Climatology I	*
GEOG	215-3	Biogeography	*
GEOG	221-3	Economic Geography	*
GEOG	241-3	Social Geography	*
GEOG	250-3	Cartography I	*
GEOG	251-3	Quantitative Geography	*
GEOG	253-3	Aerial Photographic Interpretation	*
GEOG	255-3	Geographical Information Science I	*
GEOG	261-3	Introduction to Urban Geography	
GEOG	263-3	Selected Regions	
GEOG	264-3	Canadian Cities	
GEOG	265-3	Geography of BC	
GEOG	300-4	Possible Worlds: The Rise of Geographical Thinking	
GEOG	301-4	Geographic Ideas and Methodology	
GEOG	302-3	Geography Practicum I	
GEOG	303-3	Geography Practicum II	
GEOG	310-4	Physical Geography Field Course	
GEOG	311-4	Hydrology	*
GEOG	312-4	Geography of Natural Hazards	*
GEOG	313-4	Geomorphology II	*
GEOG	314-4	Climatology II	*
GEOG	315-4	Regional Ecosystems	*
GEOG	316-4	Ecosystem Biogeochemistry	*
GEOG	317-4	Soil Science I	*
GEOG	322-4	World Resources	*
GEOG	322W-4	World Resources	
GEOG	323-4	Industrial Location	*
GEOG	324-4	Geography of Transportation	
GEOG	325-4	Geographies of consumption	
GEOG	327-4	Geography of Tourism	
GEOG	351-4	Cartography and Visualization	*
GEOG	352-4	Spatial Analysis	*
GEOG	353-4	Remote Sensing	*
GEOG	354-4	Intro to Geographic Information Systems	*
GEOG	355-4	Geographical Information Science II	*
GEOG	356-4	Cognitive Geovisualization	*
GEOG	362-4	Geography of Urban Development	
GEOG	362W-4	Geography of urban Development	

GEOG	363-4	Urban Planning and Policy	
GEOG	377-4	Environmental History	*
GEOG	381-4	Political Geography	
GEOG	381W-4	Political Geography	
GEOG	382-4	Population Geography	*
GEOG	383-4	Regional Development and Planning I	*
GEOG	385-4	Agriculture and the Environment	*
GEOG	386-4	Geography, Health and Health Care	*
GEOG	387-4	Geography and Gender	
GEOG	389W-4	Human Ecology: Human Relations to Nature	*
GEOG	391-4	Qualitative Research Methods	*
GEOG	402-3	Geography Practicum III	
GEOG	403-3	Geography Practicum IV	
GEOG	404-2	Directed Readings	
GEOG	405-4	Directed Readings	
GEOG	409-3	Geography Practicum V	
GEOG	411-4	Hydrology II	*
GEOG	412-4	Glacial Processes and Environments	*
GEOG	412W-4	Glacial Processes and Environments	
GEOG	413-4	Geomorphology III	*
GEOG	414-4	Climatology III	*
GEOG	415-4	Advanced Biogeography	*
GEOG	416W-4	Pleistocene Geography	
GEOG	417-4	Soil Science II	*
GEOG	417W-4	Soil Science II	
GEOG	420-4	Cultural Geography	
GEOG	422-4	Theories and Practices of Development	*
GEOG	426-4	Industrial Change and Local Development	*
GEOG	427-4	Selected Topics in the Geography of Tourism	
GEOG	428-4	World forests	*
GEOG	429-4	Environment and Inequality	*
GEOG	432-4	Problems in Environmental History	*
GEOG	440-4	Law and Geography	
GEOG	440W-4	Law and Geography	
GEOG	441-4	Cities, Space, and Politics	
GEOG	444-4	Regional Development and Planning II	*
GEOG	445-4	Resources Planning	*
GEOG	446-4	Migration and globalization	
GEOG	449-4	Environmental processes and Urban Development	*
GEOG	451-4	Spatial Modeling	

GEOG	453W-4	Remote Sensing of Environment
GEOG	455-4	Theoretical and Applied GIS
GEOG	457-4	Geovisualization Interfaces
GEOG	460-4	Selected Regions
GEOG	462-4	The Geography of the United States
GEOG	466-4	Latin American Regional Development
GEOG	468-4	Society and Environment in China
GEOG	469-4	The Canadian North and Middle North
GEOG	489-4	Selected Topics
GEOG	490-4	Selected Topics
GEOG	491-4	Honors Essay
GEOG	497-5	International Field Study
GEOG	600-0	Introduction to Graduate Studies: Fall Semester
GEOG	601-0	Introduction to graduate Studies: Spring Semester
GEOG	604-5	Research Design and Analytical Techniques in Human Geography
GEOG	605-4	Geographic Ideas and Methodology
GEOG	606-5	Research Design and Analytical Techniques in Physical Geography
GEOG	611-4	Hydrology
GEOG	612-4	Glacial Geomorphology
GEOG	613-4	Fluvial Geomorphology
GEOG	614-4	Climatology
GEOG	615-4	Quaternary Environments
GEOG	617-4	Soil Science
GEOG	620-4	Selected Topics: Economy, Environment and development
GEOG	622-4	Theories and Practices of Development
GEOG	626-4	Multinational Corporations and Regional Development
GEOG	640-4	Selected Topics in Social and Urban Geography
GEOG	641-4	Morphogenesis and the Build Environment
GEOG	644-4	Regional Development and Planning
GEOG	645-4	Resource Management
GEOG	646-4	Cultural Geography
GEOG	651-4	Advanced Spatial Analysis and Modeling
GEOG	653-4	Theoretical and Applied Remote Sensing
GEOG	655-4	Advanced principles of Geographic Information Science
GEOG	656-4	Aerial Reconnaissance for Remote Sensing
GEOG	666-4	Geography, Development Theory, and Latin America
GEOG	681-4	Law and the Geographies of Power
GEOG	685-4	Resources, Environment and Food Production
GEOG	691-4	Directed Readings
GEOG	697-6	MSc Thesis

GEOG	698-6	MA Thesis
GEOG	699-6	PhD Thesis

Sample of related courses external to FES:

Note that many faculties and departments have Special Topic offerings related to the environment and sustainability.

DIAL	390-392	Undergraduate Semester: Seminar, Dialogue and Final Project
DIAL	460	Seminar in Dialogue and Public Issues

EASC	104	Geohazards - Earth in Turmoil
EASC	107	Economic Geological Resources
EASC	303	Environmental Geoscience
EASC	304	Hydrogeology
EASC	313	Introduction to Soil and Rock Engineering
EASC	314	Principles of Glaciology
EASC	410	Groundwater Contamination and Transport
EASC	411	Terrain Analysis
EASC	412	Groundwater Geochemistry
EASC	413	Resource Geotechnics
EASC	418	Terrain Stability: Assessment and Mitigation
EASC	419	Forest Harvesting Technology
EASC	603	Field Techniques in Hydrogeology
EASC	605	Advanced Glaciology
EASC	613	Groundwater Modelling
EASC	619	Environmental Geoscience
EASC	623	Groundwater Resource Evaluation

SA	371	The Environment and Society
SA	363	Process of Development and Underdevelopment

EDUC	452	Environmental Education
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WS	313	Women and the Environment
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ECON	260	Environmental Economics
ECON	362	Economics of Natural Resources
ECON	460	Seminar in Environmental Economics

HSCI	216	Ecological Determinants of Human Growth, Development and Health
HSCI	304	Perspectives on Environmental Health
HSCI	443	Environmental Health Toxicology Lab

HSCI	845	Environmental and Occupational Health
CMNS	326	Applied Media Workshop
CMNS	331	News Discourse and Political Communication
CMNS	342	Science and Public Policy: Risk Communication
CMNS	346	Communication and Development
CMNS	347	Communication in Conflict and Intervention
CMNS	423	Globalization: Cultural issues
CMNS	425	Applied Communication for Social Issues
CMNS	433	Opinion, Propaganda and Political Communication
CMNS	444	Political Economy of International Communication
CMNS	446	The Communication of Science and Transfer of Technology
CMNS	447	Negotiation and Dialogue as Communication
CMNS	456	Communication to Mitigate Disasters
CMNS	845	Communication and Development
CMNS	858	Communication to Mitigate Disasters
SCI	300-3	Science and its Impact on Society *
BISC	204	Introduction to Ecology
BISC	309	Conservation Biology
BISC	312	Environmental Toxicology
BISC	440	Biodiversity
BUS	716	Sustainability
URB	630	Urban Development, Planning and Policy
URB	645	Urban Sustainable Development

Others include PSYC, ACMA, ARCH, HUM, POL SCI.

Appendix 4

SFU Expertise Relevant to FES

Department of Geography

- Ice motion, stability and decay (evolution and controls)
- Climatology
- Natural hazards
- River environments, science and management
- Sea-level change
- Global distribution of plants and animals
- Regional ecosystems
- Inland Water Ecology
- Forest ecology and management
- Soil science
- Hillslope and watershed hydrology
- Environmental earth science
- Landscape change (rivers)
- Environment and development
- Environmental ethics, economics and policy
- Resource planning
- BC forest economy and environmental conflict
- Society and environment
- Property and rights
- Rural development
- Community development
- Primary health care
- Social and cultural theories of consumption, multiculturalism and sustainable tourism
- Relationships between space, society, and power
- Political and cultural economy of labour
- Sustainable community development
- Property rights in natural resources and landscape transformations
- Pacific fisheries history
- Land use, land cover changes, urban sprawl, forestry, landscape ecology
- GIS environmental phenomena such as ocean circulation and tsunami
- Airborne remote sensing of forest environments and aquatic habitats
- GIS and health informatics

School of Resource and Environmental Management

- Application of statistical and mathematical tools to marine ecology and resource management
- Aquatic conservation and management of human impacts on aquatic ecosystems
- Tourism, community development and planning issues in tourist environments
- Behavior, effects and associated ecological and human health risks of chemical pollutants in the environment
- Resource planning in public policy
- Social science survey methods, quantitative analysis, and trade-off modelling as they relate to decision making in resource management
- Energy-economy models to assess sustainable energy and materials policies
- Economics of natural resource management in developing countries, valuation of environmental resources, bioeconomic modeling

- Climate resources and global change
- Forest ecosystem dynamics, conservation, and management
- Fisheries risk assessment and management
- Common property theory and cultural/political ecology
- Human dimensions of environmental policy and planning
- Community development, employment, and sustainability of environmental and cultural stewardship precepts and practices
- Policy, planning, and management issues in tourism and outdoor recreation
- Water and land management, environmental impact assessment, and sustainable development

Centre for Sustainable Community Development

- Sustainable community development, sustainable cities and communities
- Community economic development
- Planning and development theory, planning practice
- Climate action and sustainability leadership
- Social economy, social enterprise
- Urban sustainable development theory, policy, and planning
- Local and regional development, rural sustainability
- Transformative learning, sustainability education and organizational change
- Research methods; participatory action research
- Sustainability indicators, sustainable consumption indicators and assessment
- Sustainability innovation and entrepreneurship
- Housing and community sustainability
- Collaborative learning and innovation; negotiation and dialogue
- Multi-stakeholder engagement, societal learning, and change
- Citizen involvement in economic development
- Labour market issues, unemployment, and earnings inequality
- Community food security, food system assessment
- Agrarian reform and sustainable agriculture
- Sustainability and health
- Aboriginal economic development, aboriginal entrepreneurship
- International SCD; building CED capacity in Latin America
- Corporate social responsibility, procurement, socially responsible investment
- Strategic planning and decision support tools
- Multi-level, collaborative governance in Canadian coastal regions
- Environmental sociology, community resource management, social movements

Environmental Science

- Biology: ecology, wildlife biology, evolutionary aspects, animal ecology, plant ecology, cell biology, biological modeling, toxicology
- Chemistry: environmental chemistry, analytical chemistry, aquatic chemistry
- Statistics: statistical design
- Physics: energy and the environment

Sociology/Anthropology

- Environmental sociology
- Community resource management
- Anthropology of biology and conservation
- Social movements (environmental)
- Environment and urban anthropology

- Natural resource development
- International electricity sector analysis
- Agricultural biotechnology

And others including:

Faculty of Business Administration

Faculty of Education

School of Engineering

School of Criminology

School of Communications

Department of Biology

Department of Chemistry

Department of Earth Sciences

Department of Archaeology

Centre for Canadian Studies

Department of Urban Studies

School for Contemporary Arts

Department of Political Science

Department of Philosophy

Department of English

Department of Economics

Department of Humanities

School of Engineering

Department of First Nations Studies

Department of Women's Studies

Appendix 5a

Interdisciplinary Program Proposal

Global Systems and Sustainability Strategies

Focus and rationale

The Earth system is constantly changing as a result of natural processes. Social and economic systems are an integral part of the Earth system, and the era of industrialization has added several new and rapidly changing pressures. These pressures affect both natural and human systems and include a rapidly increasing human population, food security, extensive natural resource use, large-scale pollution of air and water, ozone depletion, and global warming. In the past few decades, the international community has recognized the importance of not only increasing our scientific understanding of changes within the Earth System, but also linking our scientific findings in a meaningful way to policy decisions and the management of natural and human systems on a variety of spatial and temporal scales.

The goal of this interdisciplinary undergraduate program is to provide students with an understanding of how human and natural systems interact to affect the environment on regional to global scales, and to place this knowledge within the context of social and economic systems, including policy analysis and governance. The research vision of faculty and graduate students in this interdisciplinary program is to consider the impacts of global change on natural and human systems through scientific quantification of these changes, to assess the predictability and uncertainties of future change, and to apply this knowledge to the develop better policies and management for the mitigation of, and adaptation to, those changes.

SFU niche

Programs in 'Global Change Science' have existed for about two decades, and most Global Change Science departments and centres focus on basic scientific understanding of natural mechanisms in ocean, atmosphere, and land systems. While Global Change is often considered synonymous with Climate Change, this particular SFU program would differentiate itself with a focus on 'Global Systems' as they pertain to the natural environment, as they interact with social and economic systems, and as they are addressed by environmental policy and governance at local to global scales.

What also separates this program from others is a focus on sustainability strategies as solutions to environmental issues. Solutions to environmental problems require the integration of knowledge of both natural and social systems. This integrated approach with a focus on applied problems will provide a unique educational niche for SFU students to evaluate solutions to environmental problems that either currently exist or are predicted. Researchers in this program will aim to develop new strategies that integrate an understanding of social and natural systems and therefore will provide more effective approaches to sustainable development.

Specifically, this program will also provide a convenient avenue by which the recently created Pacific Institute for Climate Solutions (PICS) could link with the new faculty and satisfy the PICS educational mandate. PICS was recently approved by BC Premier Gordon Campbell; it is hosted by the University of Victoria and is operated in collaboration with the University of British Columbia, Simon Fraser University, and the University of Northern

British Columbia. The institute has an endowment of \$90M and was provided with \$4.5M in operational funding for its first year, 2008. In addition to funding graduate fellowships, PICS' program responsibilities include "facilitating and promoting knowledge transfer activities." This interdisciplinary program would provide an ideal mechanism for achieving this goal.

Potential student base and degree marketability

The goals of a successful undergraduate program within the Faculty of Environment are threefold: (a) to groom students for further education in graduate programs, (b) to prepare students for professional positions within the workforce, and (c) to make them more environmentally aware citizens. Interdisciplinary programs that are designed to satisfy goals (a) and (b) are likely to be quite different in design.

The undergraduate program in Global Systems would likely comprise two streams, including a bachelor of 'science' and a bachelor of 'arts'. The 'arts' degree would be aimed at students with a firm interest in topics such as environmental governance. The purpose of this division is to ensure that students interested in the science of global systems obtain a sufficient number of science courses to have a credible, science-based degree. An appropriate subset and number of social science courses would complement this degree to provide students with a societal perspective in which their scientific knowledge will be applied.

It is anticipated that undergraduate students planning to pursue graduate education would have excellent preparation for degrees and careers in political science, public policy, law, business, communications, resource management, climatology, applied biology, and education. Skills in critical thinking, analysis, writing, and communication would provide a competitive advantage in all job markets.

Elements of interdisciplinary program

This particular Interdisciplinary Program remains intentionally broad in order to provide a means of capturing new and innovative directions that could be developed within the new Faculty of Environment and Sustainability. However, there are several specific foci that might exist underneath this particular Interdisciplinary umbrella. These are reflected by a series of focused, upper-division courses that provide expertise in one area of Global Systems. Examples include:

- (a) **Environmental Governance** – In general, the curriculum would combine courses which introduce a range of skills including the ability to understand and synthesize environmental science, analyze the effects of environmental policies on economic and social systems, and understand the full complexity of interaction between political systems at different scales. The courses in this stream focus primarily on the social sciences, but would require carefully designed instruction in the production, understanding, and deployment of natural science, just as the proposed new water science program would require targeted courses in the application of science in the policy realm.
- (b) **Climate Change, Mitigation, Adaptation, and Implementation** – The Faculty of Environment Interdisciplinary Program Planning Committee has recognized that SFU does not currently have sufficient, in-house resources to assemble a stand-alone Climate Change Program, and that to do so would unnecessarily duplicate existing excellent programs (e.g., University of Victoria) in the province. However, SFU already has excellent researchers engaged in studying other aspects of climate

change, including mitigation, the effects of climate change on natural and human systems (e.g. water and air quality, human health, ecosystem dynamics, and risk analysis), and adaptation of these systems to future change. This particular stream would combine courses in the natural and social sciences to provide an interdisciplinary perspective on these issues.

- (c) **Water Science** – Water science has been proposed as a possible, stand-alone Interdisciplinary Program. Issues of water resources, water quality, and the governance thereof are relevant at local to global scales. Placement of this science stream under the Global Systems and Sustainability Strategies umbrella is another programming option.

Like other interdisciplinary programming within the Faculty of the Environment and Sustainability, the Global Systems and Sustainability Strategies program will follow a flexible template that provides all students with at least an overview of the environmental, economic, social, and institutional dimensions of Sustainability, while also allowing them to specialize more deeply in one of those areas.

Required programming for this degree should include cross-cutting courses that are offered across the entire faculty. It is important that these courses are offered and taken at a faculty level, so that each student gets the same solid foundation for their upper division courses:

- A 1st-year course that introduces the four pillar model of Sustainability, and therefore provides an initial framework in which students will build their knowledge of global systems.
- A 4th-year 'capstone' workshop that is problem-oriented that would allow students to apply their learning to an explicit, modern-day environmental problem or situation. This course offers students with experience in cross-disciplinary dialogue, and different modes of delivery that they will encounter in when solving problems with people of varying backgrounds and cultures in the 'real world'.

In keeping with the philosophy of the 4th-year capstone course, other upper-level required courses within this interdisciplinary program (and the Faculty at large) will be developed that incorporate cross-disciplinary dialogues and real-world problem-solving approaches to expand upon students' abilities to understand and deal with complex environmental problems.

The current focus of this interdisciplinary program is at the undergraduate level, but the potential exists for this programming to develop into more focused programming at the graduate level. For example, the Master of Climate Action and Sustainability Leadership (MCASL), which is currently being developed by faculty at SFU, UBC, BCIT and ECIAD at the Great Northern Way Campus, would provide an excellent springboard for future programs that might be developed at SFU. Furthermore, existing graduate programs at SFU (e.g., REM, Geography, Earth Sciences, First Nations, Public Policy) have the potential to contribute to (and draw students from) this program, as they have existing strengths in the areas of natural sciences, environmental policy, management, and governance.

Incorporation of First Nations

Aboriginal and First Nations communities are actively seeking to build partnerships and capacities to address inherent and disproportional vulnerability to development and global change. Because most First Nations cannot relocate to avoid adverse effects, and because

of cultural and economic dependence on fishing and other customary forms of resource harvesting, climate change, sustainability, and methods for environmental and social impact analysis and mitigation are viewed as essential topics for discussion and action. Much work remains to be done to reduce the impacts of land and resource development on indigenous peoples in a manner meaningful in process or outcome to First Nations. For this reason, the proposed program should be designed to include and take advantage of opportunities for research, training, and outreach partnerships with First Nations and Aboriginal communities. Involvement of First Nations can be further developed in the context of cross-cutting courses that explore differing bases of knowledge, cultural values, modes of dialogue, and communication that become important to equitable governance and management.

Fit with existing units within the Faculty of Environment and Sustainability and integration with other SFU faculties

Such a degree requires a basis in natural system science but also requires core courses that will provide students with a firm understanding of the four pillars of Sustainability, and how they interact to address environmental issues. This program is likely to include existing courses from the new Faculty's founding units including REM, the Environmental Science Program, and Geography. Courses may also be drawn other Faculties including FASS (for example, Communications, Sociology and Anthropology) and Faculty of Science. There is also possibility to create linkages with Health Sciences (Global Health) as well as Business (Environmental Economics), Engineering Science (Environmental Engineering), and Education (Science and Environmental Education). Graduate work of the new CSCD Master of Climate Action and Sustainability Leadership, which is currently being developed by faculty at SFU, UBC, BCIT and ECIAD at the Great Northern Way Campus, will also complement undergraduate studies and provide an avenue by which undergraduate students are exposed to new and innovative research on sustainability strategies for minimizing human impacts on natural systems.

Appendix 5b

Interdisciplinary Program Proposal Biodiversity, Ecosystems and Conservation

Focus and rationale

The recent UN-sponsored Millennium Ecosystem Assessment (2005) reported that during the last half-century, human activity has altered ecosystems more rapidly and extensively than during any other period in human history, resulting in massive and in some cases irreversible loss in Earth's biodiversity. This report poses a tremendous challenge for the future; there is a dire need to enhance conservation and sustainable use of the Earth's ecosystems while still meeting growing demands for food, water, timber and fiber. Addressing this challenge will require an ever-growing scientific knowledge and monitoring of Earth's changing ecosystems, as well as societal changes in policies, institutions and practices.

The educational goal of this program is to prepare students to meet future challenges by providing them with a solid basis that integrates biodiversity, ecosystems, and conservation, while building a practical understanding of the ways that natural and conservation sciences are used in the policy making process. The research goal of this program is to foster an environment where faculty and researchers trained in traditional disciplines, such as biology, ecology, forestry, marine and coastal sciences, climatology, and conservation science, have the opportunity to combine their expertise with faculty trained in traditional social science disciplines to advance excellent research that addresses current problems affecting local to global scale ecosystems, generates policy-relevant knowledge, and conveys that knowledge in ways that are effective for both policy-making and management of ecological systems.

The program title expresses the rationale. 'Biodiversity' captures the range of issues related to organismal biology and diversity, 'ecosystems' ensures that broader issues tying biodiversity to both ecological and physical processes are represented, and 'conservation' indicates that both of these are being viewed through an applied lens – with clear relationships to the relevant social sciences as well.

SFU niche

While regional programs and centres in biodiversity and conservation already exist (for example, the Centre for Biodiversity Research at UBC, Science, Zoology and Botany at UBC, and the Undergraduate Program in Wildlands Conservation and Management and Centre for Applied Conservation Biology, UBC, Forestry). These programs tend to be organism-oriented, and they do not provide a vehicle for communication between separate areas of study: one centre is very applied in orientation and one is very basic in orientation. A new SFU program that integrates the study of biodiversity, ecosystems, and conservation has the potential to carve its own niche by offering an interdisciplinary approach and providing distinct linkages between the natural and social sciences.

Potential student base and marketability

The goals of a successful undergraduate program within the Faculty of Environment are threefold: (a) to groom students for further education in graduate programs, (b) to prepare students for professional positions within the workforce, and (c) to make them more

environmentally aware citizens. Interdisciplinary programs that are designed to satisfy goals (a) and (b) are likely to be quite different in design.

This program would provide a science-based degree, but with the options to earn the equivalents of either a bachelor of 'science' or a bachelor of 'arts.' The former would provide stronger scientific credentials for students intending to pursue graduate degrees or careers in the sciences. Some students obtaining a degree in the area of Biodiversity, Ecosystems, and Conservation would be prepared to pursue graduate degrees in programs such as Ecology, Conservation, Environmental Policy, and Environmental Management and Regulation.

The B.A. degree follows the model of a liberal arts degree. This degree would maintain a core focus in sciences but with fewer required credits in natural sciences. Therefore, this degree would provide more freedom to pursue courses in relevant disciplines within the Faculty, such as environmental governance, development and the environment, and outside the faculty, such as archaeology, First Nations studies, public policy, urban studies, and anthropology.

In general, relevant careers for this degree include (but are not limited to) fields such as Environmental Management and Regulation, Ecology, Environmental Policy, Conservation, Waste Management, Outdoor Recreation Management, Research and Development, and Academia. Potential employers for students with either a B.Sc. or B.A. degree might include: non-governmental organizations, consulting firms, state and federal agencies, firms specializing in conservation, ecology, and environmental issues, and scientific and research groups.

Elements of interdisciplinary program

The concrete design of such a program is premature without proper time to consult with all contributing units. As such the following section is necessarily general. However, the following detailed elements might be incorporated into degree programs. This section provides examples of existing programs that might interact with this new program.

Like other interdisciplinary programming within the Faculty of the Environment and Sustainability, the Global Systems and Sustainability Strategies program will follow a flexible template that provides all students with at least an overview of the environmental, economic, social, and institutional dimensions of sustainability, while also allowing them to specialize more deeply in one of those areas.

Required programming for this degree should include cross-cutting courses that are offered across the entire faculty. It is important that these courses are offered and taken at a faculty level, so that each student gets the same solid foundation for their upper division courses:

- A 1st-year course that introduces the four pillar model of Sustainability, and therefore provides an initial framework in which students will build their knowledge of global systems.
- A 2nd-year course in Environmental Ethics, which incorporates examples of environmentally responsible citizenry and can help to provide a cultural lens through which environmental, economic, and social issues and initiatives might be viewed.
- A 3rd year course in Resource Management Institutions that places an emphasis on both traditional and new and innovative governance structures. The purpose of such a course is to ensure that students – in particular science students who otherwise

might not be exposed to these topics - gain a critical understanding of management institutions. A current example of this type of course already taught at SFU is REM 356.

- A 4th-year 'capstone' workshop that is problem-oriented that would allow students to apply their learning to an explicit, modern-day environmental problem or situation. This course offers students with experience in cross-disciplinary dialogue, and different modes of delivery that they will encounter in when solving problems with people of varying backgrounds and cultures in the 'real world.'

This program will then provide more comprehensive programming that focuses on the natural science and environmental dimensions of Sustainability. In other words, upper level courses would allow for specialized courses within the areas of Biodiversity, Ecosystems, and Conservation. These courses might include courses already being taught, but might also draw upon new expertise from 1-2 of new faculty hires.

In keeping with the philosophy of the 4th-year capstone course, other upper-level required courses within this interdisciplinary program (and the Faculty at large) will be developed that that incorporate cross-disciplinary dialogues and real-world problem-solving approaches to expand upon students' abilities to understand and deal with complex environmental problems. Programming along these lines could include:

- 4th year 'Honors' projects - an interdisciplinary project supervised by 1-2 individual faculty members. Projects would be expected to integrate some aspect of interdisciplinary research and community outreach.
- A field course following the model of the SFU 2008 archaeology field school, which represented a detailed collaboration between SFU researchers and First Nation community interests and goals. Community members were involved in every step of the planning and implementation of an eight-week program, resulting in several interdisciplinary research themes that will structure future collaborative research, training, and outreach. Example research themes include (a) herring use, ecology, and history, (b) cultural landscape (trans)formation, and (c) developments in intertidal farming (e.g., fish traps and clam gardens).

The current focus of this Interdisciplinary Program is at the undergraduate level, but the potential exists for this program to develop into more focused programming at the graduate level. Furthermore, existing graduate programs at SFU (e.g., REM, Geography, Biological Sciences, Public Policy) have the potential to contribute to (and draw students from) this undergraduate program.

Incorporation of First Nations

The proposed program offers a superb opportunity for broad institutionalization of attention to Aboriginal and First Nations interests in knowledge sharing, capacity building, and problem solving. Cultural ecosystem heritage conservation is among the most rapidly expanding areas of concern and investment by First Nations and Aboriginal communities in Canada. The explicitly applied orientation of the program provides a basis for collaborative engagement of Aboriginal and First Nations students, researchers, communities, and issues in training, outreach, and investigative initiatives. SFU has a distinguished record of reciprocal, project-by-project collaborations, and these provide points of orientation for program direction and foundations for program growth and development. New course offerings that might be included to address this goal include: a course in 'Traditional Knowledge and Ethno-Science', which could be co-taught by an SFU faculty member and a

Native land-user. In addition, we fully expect First Nations communities, perspectives, and issues to be represented in problem-oriented capstone courses.

Fit with existing units within Faculty of Environment and Sustainability, and with other SFU faculties

The research and teaching aspects of this program is close to the core research areas of faculty from within the existing units of the Faculty of Environment and Sustainability, including 4-5 REM faculty and members of Geography. Furthermore, from departments outside the new faculty, we envision members of the Aquatic Conservation group and others within the Department of Biological Sciences as prime contributors to this program.

Such a degree program would also provide a strong complement to other proposed Interdisciplinary Programs, existing undergraduate programs such as the Environmental Science and Geography, and graduate programs such as the REM MRM and Ph.D. programs and the Development Studies Certificate program. This proposed interdisciplinary program could contribute students with strong scientific credentials to any seminars, capstone courses, or other cross-cutting educational dialogues that are planned for the Faculty.

SFU academic units that may participate in the program include the prospective units within the FES as well as Archaeology, Biology, and First Nations Studies. For example, joint work between REM and Archaeology has developed an increasingly important source of well-dated packages of ecosystem data and of insight into ancient and long-term change in human ecosystems. First Nations Studies provides critical sources of, and compelling alternatives to, accepted definitions of environment, research, and knowledge, as well as guidance in forging collaborations with aboriginal communities.

Appendix 5c

Interdisciplinary Program Proposal

Environment and Development

This program focuses on the search for sustainable forms of development in the context of current unsustainable practices and their complex consequences. The program will develop and test sustainable solutions to current and future environmental problems related to socio-economic advancement and will prepare students for public engagement in the development of new strategies for sustainability. As the scale of these complex questions involves the whole world, the roles of individuals, societies, states and organizations at every level from the local to the international can only be understood in the context of the large body of knowledge built up on the consequences of earlier development strategies, in the search for sustainability. SFU has researchers and advanced students from all parts of the globe currently working on such issues in many units and Departments, and a broad-based inter and multi-disciplinary program in FES has the potential to shape and articulate this intellectual capital in new and useful ways.

Environment and Development encompasses a broad range of research and policy concerns in both developed and developing countries. This program examines the nature of world 'environmental movements' such as those leading to 1972 the Stockholm conference, the creation of UNEP and action groups like Greenpeace in the early 1970s, and those activities ensuing from the 1987 World Commission on Environment and Development (Brundtland) which coined the term 'sustainable development' as a way to overcome zero-sum thinking about the nature of socio-economic and ecological interactions. Programming would be based on the premise that human impacts on ecological systems are largely manifested through development activity. Development, in this context, includes economic, technological and industrial advancement, and social development of urban and rural settlements. Research on the ecological impact of resource use and production will be complemented by research on human environments - for example, urban settlements and landscapes, and the cultural and social practices they embody and articulate. Existing FES units share driving interests in development-related topics such as urban policy, planning and politics and their impact on humans in terms of health, gender, age, class and race; upon societies and their economies; and upon different types and scales of communities, organizations, and social relationships. The new Faculty will help promote collaborative research on innovative policies, practices and relationships as they are developed within cities, and transferred across the urban hierarchy, with both intended and unintended consequences, locally and globally, including their impact on rural society, economies and ecologies. Research on commodities and industrial ecology, for example, emphasizes the environmental impacts of industrial societies and the design of industrial complexes that mitigate and minimize regional impacts; life cycle analysis identifies the full environmental costs of commodities and products, from their resource inputs and energy requirements, to disposal and/or recycling.

This FES program aims to bring units into closer conversation with related disciplines, and to offer enhanced potential for collaborative research on the ways in which social and ecological environments are founded, formed, and framed. It brings together a range of social and natural scientists, as well as those scholars interested in cultural expressions, education, health and business together to help understand the manner in which individuals and groups interact to re-create and consume new and old environments. This broad-based

interdisciplinarity is required since while social structures, systems, and networks create environments as places characterized by the human interactions that happen within them, individuals, groups, and societies socially construct and give meaning to many understandings of 'environment' within the context of scientific and traditional knowledge about natural processes and phenomena and public and private disagreements arise in the context of those understandings. This program would have both a graduate level platform and a senior undergraduate platform: in which activities at one level will stimulate activities in the other. In addition to the teaching capacity coming in to the new FES (e.g. in CSCD, REM, GEOG, Development Studies), the committee identified affiliated courses and researchers outside the faculty who would contribute by (a) enabling FES students to flow through their courses in their units; and (b) taking part in team-taught or co-taught elements of FES Environment and Development program offerings. These 'external' courses and individuals are presently located in such units as Sociology and Anthropology, Health Sciences, Political Science, Education, Humanities, First Nations Studies, Urban Studies, Communication, Women's Studies, History, Canadian Studies, Gerontology, Philosophy, Criminology and Business. The multi-unit teaching model of the Development Studies core seminar suggests a model of team-teaching at the graduate level, and Development Studies will participate fully in the design of a new Environment and Development program at the senior undergraduate level too. The Program Leader in Environment and Development would facilitate the interaction of graduate research done outside FES with graduate students working in FES units, and establish a small honours program for high performing senior undergraduates, preparing them for advanced studies and possible leadership roles. Placements, coop education, and internships would be combined with field courses and schools to provide an experiential balance with conceptual and research training.

Appendix 5d

Interdisciplinary Program Proposal

Water and Environment

Focus and rationale

In the coming years, water quantity and water quality issues will be intensified owing to increased water demand, changes in land use, and other competing interests. Adequate supplies of water of appropriate quality are critical to underpin economic vitality and productivity, support environmental restoration and maintenance, and provide for society in equitable ways. Moreover, climate change is anticipated to have significant impacts on global water distribution and availability. Universities have a major responsibility to prepare future water scientists, managers and policymakers to meet these challenges.

Water is an immensely complex subject which requires the mastery of many disciplines from the practical sciences of hydrology and climate, to an understanding of social organization and the law. The goal of an Interdisciplinary Program on Water and Environment is to provide students with a solid foundation in the hydrologic and climate sciences, with complementary strengths in environmental economics, biology/ecology, social sciences, and law. The research vision of this interdisciplinary program is to consider the impacts on water availability and sustainability under threats of environmental change through scientific quantification of changes, assessment of predictability and uncertainties of future change, and application of this knowledge to the development of better policies for mitigation and adaptation to those changes. Several researchers at SFU focus on water, and many already bridge gaps between the physical and social sciences through their involvement with public policy and governance teams. This interdisciplinary program is a logical extension of SFU's existing academic strengths in these areas.

SFU niche

Environmental programs in 'water' are few across Canada and elsewhere despite the importance of water at a global scale. Most water-related programming is housed within Civil Engineering Departments, and focuses on Water Resources in respect of municipal water systems (e.g., waste-water management). Only a few programs exist on Watershed Science or Watershed Planning, notably UBC's graduate certificate in Watershed Management. The proposed Water and Environment program at SFU would be different in that it would focus on water from an interdisciplinary perspective and would place SFU in a lead position on water-related education in Canada.

At the outset, and with minimal additional resources, this interdisciplinary program could offer a degree program in Water Science (B.Sc.) with major, honours and minor degrees. The water science degree program would be one-of-a-kind in that it will provide a strong science-based interdisciplinary training in 'water' but draw on SFU's liberal arts strengths by complementing the science courses with relevant courses in other disciplines. As the interdisciplinary program develops, additional programs both at the undergraduate and graduate levels could be added, for example, in water management, water policy and law, etc.

Elements of interdisciplinary program

The undergraduate program would initially offer major, honors and minor degree programs in Water Science:

"The Water Science degree program would provide strong science-based interdisciplinary training in the hydrologic and climate sciences, complemented by courses in biology/ecology, economics, social sciences, and law (governance). Graduates of this B.Sc. program will have the credentials in water science to contribute broader discussion/debate on water management and water policy. They will be able to work alongside discipline-specific scientists in hydrology, hydrogeology, and climatology, offering a broader perspective on water management issues."

The Faculty of Environment and Sustainability provides a unique opportunity to assure that students pursuing degrees in water-related disciplines have a solid foundation in interdisciplinary study. The Water and Environment Interdisciplinary Program will require students to take a collection of courses (both at the introductory level and at the upper division level) with students from the other Interdisciplinary Programs. Such course structuring would be difficult, if not impossible, to impose on other existing program structures across campus. The introductory course ENV 1XXW- Interdisciplinary Studies on the Environment would introduce all students within the interdisciplinary programs to the four main themes within the faculty (currently Biodiversity, Ecosystems and Conservation, Global Change and Solutions, Development and Environment, and Water and Environment). At the upper division level, likely in the 4th year, students will re-assemble to take one or more capstone courses on current issues and ideas, such as climate change, water sustainability or food security that will be offered jointly with other interdisciplinary programs within FES.

The undergraduate program will initially draw on existing courses with the exception of the interdisciplinary courses identified above and five new water-specific courses. These new courses will include ENV 1XX-3 Water Resources, ENV 3XXW-3 Environmental (Water) Law, Policy and Governance, ENV3XX-3 Introduction to Physical and Chemical Oceanography, ENV3XX-3 Land Use and Water Quality, and ENV 4XXW-3 Water Problem Analysis/Planning.

Future growth areas for the program will depend on areas of specialization for new hires over the years. Priority areas for hiring identified during the consultation stage include oceanography, water policy and law, watershed modeling. Other possible new courses include: Water pollution and human health; Aquatic toxicology – note that Environmental Toxicology is no longer offered; Oceanography – 2nd course; Water systems - Rivers, Lakes, Wetlands, Estuaries, and Oceans.

The Water Science undergraduate degree program within the Water and Environment Interdisciplinary Program can be offered by Fall 2009 with provision for perhaps two sessional appointments. Over time, new courses in Economics and Environmental Decisions, Environmental Law, other courses in areas of specialization for new hires, etc. can replace courses or add to the program.

Competition

In relation to Water and Environment, there exist a few programs on watershed science but they do not include coastal areas. Engineering water programs exist but are not in direct

competition with FES. UBC offers some water governance courses and a water management certificate (watershed management is also offered elsewhere).

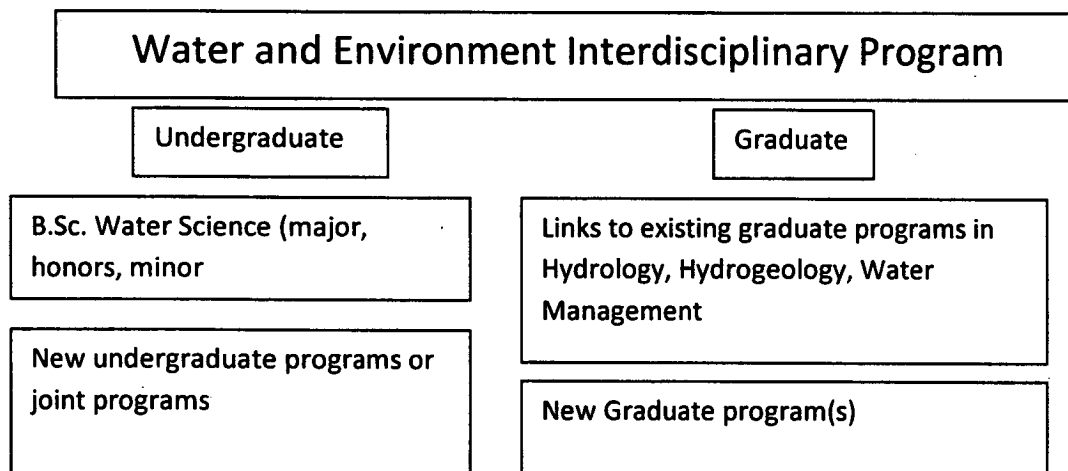
Existing graduate programs

SFU currently offers three graduate degree programs on various aspects of water.

- REM – Water Resources Management
- Department of Geography – Hydrology, Climatology
- Department of Earth Sciences – Hydrogeology, Glaciology, Hydrogeochemistry

At the graduate level, there is potential to develop new graduate programs in the Water and Environment Interdisciplinary Program that focus on watershed planning/analysis/modeling, water policy, and water and economics. For example, a Water Policy program, perhaps offered as a joint program between the School of Public Policy and the Water and Environment Program, could focus on the policy nexus between the natural and physical sciences, social sciences, legal frameworks, institutions, and management issues confronting both the public and private sectors. The institutional arrangements that govern water allocation and water quality, and the scientific basis for management decisions, are of fundamental importance to water policy. The program would likely attract science graduates who have an interest in water policy.

At this stage, it is somewhat premature to develop a graduate program. Within one or two years, with joint faculty positions, faculty secondments, and new faculty hiring both within the FES and more broadly across the university community, a graduate program will be developed.



Potential undergraduate degree requirements

Major program requirements

Water Science (B.Sc. major)

Students complete 120 units including:

- minimum of 36 units at the 300 and 400 division as specified by the major program
- additional upper division units to total a minimum of 44 upper division units
- all undergraduate students enrolling in September 2006 and thereafter must fulfill the new curriculum writing, quantitative, and breadth requirements
- a minimum program 2.00 cumulative grade point average (CGPA) must be obtained on the overall major program requirements, as well as a minimum program grade point average of 2.00 in the upper division major program courses.

Additional requirements, as specified by the major program and in General Information, may be required.

B.Sc. honors program and honors first class requirements

This program provides in-depth study in a single field and requires the student to concentrate his/her studies in the fifth to eighth levels in the chosen field. It is recommended for those intending to proceed to advanced degrees provided they meet the entrance requirements and maintain the required standing.

Students applying for honors program admission will normally have a cumulative grade point average of 3.00 (B standing) and are expected to maintain this standard to continue in the honors program.

Students complete 132 units including:

- a minimum of 48 upper division units in one subject area
- additional upper division units to total to a minimum of 60 units of upper division credit
- all undergraduate students enrolling in September 2006 and thereafter must fulfill the new curriculum writing, quantitative and breadth requirements
- a program 3.00 CGPA minimum must be obtained on the overall honors requirements, as well as a minimum program GPA of 3.00 in the upper division required honors program courses. (See "Student Appeals" on page 36 of the General Regulations section regarding graduation GPA requirements on all course work completed at Simon Fraser University.) Honors students who obtain both a program and a graduation minimum GPA of 3.5 are eligible for the designation 'first class'.

Students must also complete additional requirements as specified by the honors and in the section called 'Honors Program'.

Minor program requirements

Water Science (B.Sc. minor)

This program will allow students pursuing degree programs in other disciplines to focus on a theme within water science including ecosystems, chemistry, hydrology, climatology, hydrogeology, environmental management. Students must complete 9 credit hours of core water courses, plus an additional 9 upper division credits in Water Science designated courses along with the necessary pre-requisites.

Writing, quantitative, and breadth requirements

Students completing degree programs must fulfill writing, quantitative and breadth requirements as part of their program.

See Appendix 6 for an example of the potential cross-unit courses for a B.Sc. Major in Water Science.

Appendix 6

Example of FES Collaborative Cross-Unit and Cross-Faculty Course Support for Water Science Program B.Sc. Major (examples of potential required and elective courses)

REM courses	GEOG courses	Other faculties' courses: Applied Science	Other faculties' courses: FASS	Other faculties' courses: Science	Other Faculties': HS
REM 100-3 Global Change	GEOG 111-3 Physical Geography	CMNS 130W-3 Explorations in Mass Communication	ECON 103-4 Principles of Microeconomics	BISC 101-4 General	HSCI 130-3 Foundations of Health Science
REM 311-3 Applied Ecology and Sustainable Environments	GEOG 215-3 Biogeography	CMNS 110-3 Introduction to Communication Studies	ECON 260-3 Environmental Economics	BISC 102-4 General	
	GEOG 213-3 Geomorphology	CMNS 260-3 Empirical Communication Research Methods	ENGL 101W-3 Introduction to Fiction	MATH 151-3 Calculus I	
	GEOG 214-3 Climatology	CMNS 261-3 Documentary Research in Communication	ENGL 199W-3 Introduction to University Writing	MATH 154-3 Calculus I for the Biological Sciences	
REM 356-3 Institutional Arrangements for Sustainable Environmental Management	GEOG 221-3 Economic Geography	CMNS 342-4 Science and Public Policy: Risk Communication	FNST 101-3 The Cultures, Languages and Origins of Canada's First Peoples	CHEM 121-4 General Chemistry and Laboratory I	
REM 412-3 Environmental Modeling	GEOG 255-3 Geographical Information Science I		HUM 101W-3 Introduction to the Humanities	PHYS 120-3 Mechanics and Modern Physics	
	GEOG 310-4 Physical Geography Field Course		IS 101-3 Introduction to International Studies: Studying Global Conflict and Co-operation	PHYS 101-3 Physics for the Life Sciences I	
	GEOG 311-4 Hydrology I		PHIL 100W-3 Knowledge and Reality	BISC 204-3 Introduction to Ecology	
REM 445-3 Environmental Risk Assessment	GEOG 313-4 Geomorphology II		POL 100-3 Introduction to	CHEM 126-2 General Chemistry Laboratory II	
	GEOG 315-4 Regional Ecosystems			MATH 152-3 Calculus II	
	GEOG 316-4 Ecosystem Biogeochemistry			MATH 155-3 Calculus II for the Biological Sciences	

GEOG 322-4 World
Resources

CHEM 360-3
Thermodynamics and
Chemical Kinetics

GEOG 314-4 Climatology II

GEOG 317-4 Soil Science I

GEOG 351-4 Cartography
and Visualization

GEOG 411-4 Hydrology II

GEOG 413-4 Geomorphology
III

GEOG 412-4 Glacial
Processes and Environments

GEOG 414-4 Climatology III

GEOG 417-4 Soil Science II

GEOG 100-3 Human
Geography

GEOG 377-4 Environmental
History

Politics and Government

POL 223-3 Canadian
Political Economy

POL 252-3 Local
Democracy and
Governance

SA 150-4 Introduction to
Sociology (S)

SA 250-4 Introduction to
Sociological Theory (S)

SA 326-4 Ecology and
Social Thought (S or A)

PHYS 121-3 Optics,
Electricity and Magnetism

PHYS 102-3 Physics for the
Life Sciences II

STAT 101-3 Introduction to
Statistics

BISC 414-3 Limnology

EASC 304-3 Hydrogeology

BISC 304-3 Animal Ecology

BISC 337-4 Plant Biology

BISC 407-3 Population
Dynamics

BISC 404-3 Plant Ecology

CHEM 371-3 Chemistry of
the Aqueous Environment

EASC 410-3 Groundwater
Contamination and
Transport

EASC 412-3 Groundwater
Geochemistry

EASC 314-3 Principles of
Glaciology

EASC 416-3 Field
Techniques in
Hydrogeology

Appendix 7

SFU Strategic Research Plan Priorities

- Maximize opportunities for discovery and innovation;
 - Promote internationally competitive research and scholarship;
 - Cultivate excellence through selective investment in emerging areas of research;
 - Facilitate collaborations across disciplinary and institutional boundaries;
 - Recruit and retain outstanding students, research fellows, and faculty;
 - Encourage effective communication and dissemination of research results;
 - Optimize use of our research and scholarship resources;
 - Recognize the full value of intellectual property;
 - Achieve thematic coherence in the expression of SFU's research interests;
 - Engage all our communities for the benefit of society.
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Appendix 8

Demand Research for FES

In its 2007 report, ECO Canada forecast that environmental employment in Canada is expected to rise by 1.6% annually from 2006 to 2011, while other industries can expect an annual increase of 1.4%.⁵⁴ Since ECO Canada's last study in 2004, new regulations and the public's interest in greenhouse gases, energy efficiency, cleanup of brownfields, and other environmental topics have transformed environmental work.⁵⁵

In the next academic programming phase for the FES, additional market research on specific individual proposed IPs should be considered in the regular development and approval process. Further detailed information should include:

- a. identifying the specific resources available (existing expertise, courses, and funds) that could be incorporated into the new programs;
- b. identifying any additional resources that will be available in the future for new programs;
- c. a market study on student demand for proposed programs;
- d. current and future career prospects for graduates of the proposed programs; and
- e. existing competition from comparable programs in Canada and abroad.

Eco Canada⁵⁵ states, *"Continued growth in worldwide environmental consciousness also means a continued growth in prosperous new work opportunities. As forecasts of employment growth in the environmental sector double the national average in the next two years, environmental professions have become the hottest career opportunities for anyone from new graduates to seasoned veterans in other industries. Growing demand for workers, higher than average salaries, employer dedication to professional development, the ageing work force, and the opportunity to positively contribute to the environ are all emerging factors that are creating lucrative and engaging careers possibilities in the environmental sector"*

According to ECO Canada's 2008⁵⁶ *Employment Labour Market Study*, 65% of environmental employers in Canada were hiring for environmental positions during 2007; this percentage is expected to grow within the next two years. ECO Canada also lists the five hottest "green" careers in Canada today as:

- *Environmental Engineer*
 - *Environmental Technologist/Technician*
 - *Conservation Biologist*
 - *Geographic Information System (GIS) Analyst*
 - *Environmental Communications Officer*
-

⁵⁴ http://www.eco.ca/pdf/LMI_Industry_Final_2007_EN.pdf.

⁵⁵ <http://blog.lidc.sfu.ca/careerservices/p=1344> The "green" collar job boom: Environmental sector growing 60% faster than economy.

⁵⁶ <http://www.eco.ca/portal/mediaroom.aspx?display=1022>

Appendix 9

Environmental Programs at Selected Canadian Universities⁵⁷

University	Environmental faculty or equivalent	Components	Undergraduate and Master's degree programs	Size (average annual grads in last 5 yrs)
Alberta	Faculty of Agriculture, Forestry and Home Economics	Department of Renewable Resources	B.Sc., Environmental and Conservation Sciences; MSc	N/A
Calgary	Faculty of Environmental Design		MED, Environmental Science	14
Dalhousie	Faculty of Management	School for Resource and Environmental Studies	Master of Environmental Studies (MES), Master of Resource and Environmental Management (MREM).	N/A
Guelph	Ontario Agricultural College	Faculty of Environmental Sciences; School of Environmental Design and Rural Development	B.Sc., Environmental Sciences; M.Sc., Rural Planning and Development	N/A
Manitoba	Clayton H. Riddell Faculty of Environment, Earth, and Resources	Department of Environment and Geography; Department of Geological Sciences; Natural Resources Institute	B.Sc., Physical Geography, Bachelor of Environmental Sciences, Bachelor of Environmental Studies, Master of Environmental Science, Master of Environment; B.Sc., Geological Sciences, M.Sc., Geological Sciences; Master of Natural Resources Management	78 UG; 23 G (2005)
McGill	McGill School of Environment	17 faculty jointly appointed with other units	B.A., Environment, B.Sc., Environment; Graduate Environment Option	N/A
Queen's	Faculty of Arts and Science	School of Environmental Studies	B.Sc., Environmental Science, Master of Environmental Studies	N/A
Saskatchewan	School of Environment and Sustainability (proposed)		Master of Environment, Master of Applied Environmental Processes, M.A. or M.Sc. programs on environmental themes (proposed)	
Toronto	Faculty of Arts and Science	Centre for Environment	Collaborative Master's programs, Master of Environmental Science; Collaborative undergraduate programs in environment and science, environmental policy and practice, and environment and society	N/A (began in 2005)
Waterloo	Faculty of Environmental Studies	Department of Environment and Resource Studies, Department of Geography, School of Planning	Bachelor of Environmental Studies; M.A., Planning; Master of Environmental Studies; Master of Applied Environmental Studies and others	230 UG; 52 G
York	Faculty of Environmental Studies		Bachelor in Environmental Studies; Master in Environmental Studies	65 UG; 107 G

⁵⁷ Munro, J.M., *A Vision for Environmental Programming at Simon Fraser University*. 2007