

**Commission Work of the Basic Research  
on the Science and Technology and others**

**Fiscal Year 2008**

**“Study of Environmental Leadership Training  
Programmes in the World”**

**Research Report**

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**Institute for Global Environmental Strategies (IGES)**

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The contents of this report should be understood as consent opinions of the research members and does neither reflect those of IGES and the Cabinet Office of the Government of Japan.

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## Executive Summary

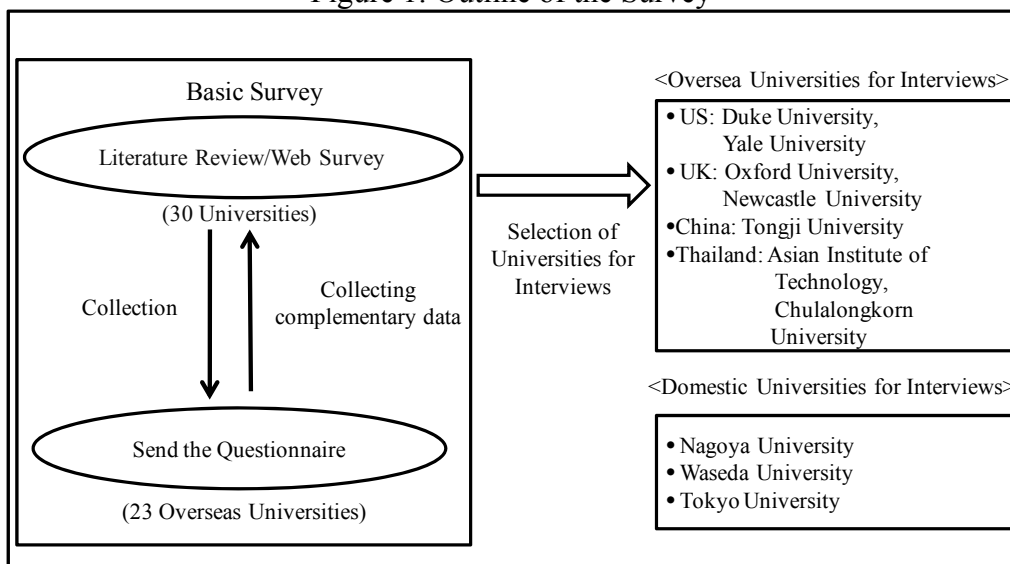
This report describes the commission work of the basic research on the science and technology and others, titled “Study of Environmental Leadership Training Programmes in the World” in fiscal year 2008. This study was based on the policy strategy to develop “environmental leaders” as part of Science and Technology diplomacy (Plenary Meeting of the General Technology Conference, May 2008) promoted by the Council for Science and Technology Policy, and “Innovation Plan for Environmental Energy” (Plenary Meeting of the General Technology Conference, May 2008) adopted under the direction of the Prime Minister of Japan. The purpose of this study is to gather the preliminary data which can contribute to the development and improvement of university programs, aiming for the promotion of human resource development in the next generation.

As a designated organization for this commission work, Institute for Global Environmental Strategies (IGES) has conducted the following study.

### 1. Understanding the Current Status of Environmental Leadership Development Programmes in the World

This study focuses on the current status of environmental leadership training programmes in higher education at universities around the world. The purpose of this study is therefore to gather the current situations of relevant programs, including their contents, targeted groups for leadership development, in order to make suggestions for the development of the relevant programs in Japanese universities in the future. The approach to conduct this study is described in Figure 1, with the study items listed in Table 1.

Figure 1: Outline of the Survey



As a preliminary study, a literature review, web searches, and interview surveys of those closely involve with the environmental leadership training programmes in higher education in the world were conducted. Through the literature review and web search, basic information such as overall concept and syllabus of the programs of a total of 30 universities (five in Japan, and 25 outside Japan) that have programs related to environmental leadership development was conducted. In addition, questionnaires were sent to overseas universities to complement the basic information related to the university programs.

Table 1: Items of the Survey

	<b>Web/Literature Review</b>	<b>Question Items</b>	<b>Interview</b>
General Information of Graduate School	<ul style="list-style-type: none"> <li>Title of the programme</li> <li>Title of the degree</li> <li>Requirements for completion</li> <li>Background of establishment of the programme</li> <li>Purpose of the programme</li> <li>Number of academic staff (full-time, part-time)</li> <li>Number of students (male-female ratio, international students, age span, students from the workforce)</li> </ul>	<ul style="list-style-type: none"> <li>Background of establishment, Year of establishment, Purpose of establishment, Characteristics</li> <li>Number of students (male-female ratio, international students, age span, students from the workforce)</li> <li>Number of academic staff (full-time, part-time)</li> </ul>	<ul style="list-style-type: none"> <li>Background of establishment of the programme</li> </ul>
Image of Human Resource	<ul style="list-style-type: none"> <li>Image of environmental leaders</li> </ul>	<ul style="list-style-type: none"> <li>Definition of environmental leaders, expected abilities for Students</li> <li>Entry requirement</li> </ul>	<ul style="list-style-type: none"> <li>Concrete image of environmental leaders</li> <li>Elements to be environmental leaders</li> <li>Necessary education for training environmental leaders</li> <li>Distinction between leaders and environmental leaders</li> <li>Entry requirement</li> </ul>
Activities for Human Resource Development	<ul style="list-style-type: none"> <li>Information about curriculum</li> <li>Contents of a syllabus</li> <li>Information of facilities</li> </ul>	<ul style="list-style-type: none"> <li>About courses, programmes, syllabus (core subject, human skill, evaluation of classes, practical study, credit exchange, cooperation with other universities, challenges for further development)</li> <li>About facilities</li> </ul>	<ul style="list-style-type: none"> <li>Reasons for establishment of the programme</li> <li>Core subject in the curriculum</li> <li>Syllabus information</li> <li>Methods of gaining human skills</li> <li>Methods of cooperating with external organisations</li> </ul>
Career of graduates		<ul style="list-style-type: none"> <li>Career of graduates</li> <li>Efforts to strengthen network among graduates</li> </ul>	<ul style="list-style-type: none"> <li>Career of graduates</li> </ul>
Others		<ul style="list-style-type: none"> <li>Licenses/certificates that students can gain.</li> <li>Evaluation of academic staffs</li> <li>Student life</li> <li>Scholarship</li> </ul>	<ul style="list-style-type: none"> <li>Advantages of the school</li> <li>Efforts to gain external fund</li> </ul>

After the preliminary study of 30 universities, 10 universities were selected to conduct in-depth study of the relevant programs. Of those 10 universities, three were in Japan, two in the United States, two in the United Kingdom, two in Thailand, and one in China. For those 10 universities, on-site interviews to study the image of environmental leaders to be developed as well as contents and characteristics of environmental leadership training programs were conducted. Further, for enhancing effectiveness and efficiency of this study, the group of experts were appointed and three experts' meetings were held.

## **2. Analysis of Environmental Leadership Training Programmes in the World**

Based on the outcomes produced through the aforementioned study approach, benchmark criteria as a standard to assess the environmental leadership training programmes were developed. By utilizing the set benchmarks, attempt to find characteristics and predominant features of each programs was conducted. Further, based on the information collected through this study, analysis was carried out to find out the uniqueness and innovativeness of each university's program. Through these attempt, the uniqueness, strengths, and areas of improvement of Japanese university programs, in comparison to other relevant programs in abroad were assessed.

Of the overall study conducted, this report abstracts the result of the analysis as well as in-depth study of the 10 universities. It is hoped that this report will contribute to the further enhancement of the higher education programs related to environmental human resource development.

## **Chapter 1: Analysis of the Global Environmental Leadership Programmes in the World**

### **1. Background of Research**

Attention to the topic of human resource development, in particular the nurturing of environmental human resource fitting to Asia and the world, has increased. The Government of Japan acknowledges the development of environmental leaders to be an urgent task, as referred to in policy proposals such as “Innovation 25” and the “21<sup>st</sup> Century Environment Nation Strategy”. From the perspective of international cooperation as well, the transition from conventional ODA to a human resources development model has begun as part of scientific technology-oriented foreign policy. Furthermore, there must certainly be coordination between the development of environmental leaders and mid-term goals related to environmental issues and socio-economic development. These goals are, namely, the establishment a low-carbon, sound material-cycle, nature symbiotic society by 2050, and the global dispatch of the technology and systems which make up the foundation of such a society. At present state of affairs, the Government of Japan recognises this course of direction. In order to achieve such a future society, a strategy to begin actively developing environmental leaders is now necessary, and numerous efforts across Japan are essential. Currently, a variety of programmes have begun both inside and outside Japan aimed at the development of environmental leaders. In order to implement future programmes as a part of national policy, at this juncture, it is first possible and most important to investigate the current state of environmental leadership development in the world, apprehend the pioneering programmes and modes of instruction, and apply these to domestic environmental leadership training programmes.

Towards this goal, the 2008 Science and Technology Foundational Research Commissioned Project, titled “Study of the Environmental Leadership Training Programs in the World”, was conducted. The first phase was the establishment of an expert meeting. Based on the deliberations of the expert meeting, the second phase consisted of a series of investigations and analyses related to the study of the environmental leadership training programs in the world. During the second phase, target universities and research topics were set based on discussion among expert meeting attendees. The Institute for Global Environmental Strategies (IGES) was in charge of research, and submitted its research findings to the expert meeting, where results were analysed. The following is a summary of the study of the environmental leadership training programmes in the world, the results of analyses, as well as opinions incurred from these findings.



## **2. Concept of Environmental Leader**

Although the term “environmental leader” refers to a concept used in an extremely broad and ambiguous sense, it was found that universities around the world shared a nearly identical conception of the term. Summarily, an environmental leader is “a person who has gained expertise in an academic field, who holds an interdisciplinary perspective related to the environment, who from a position of responsibility makes practical use of such knowledge and skills, and who is capable of making a contribution to the formation of a sustainable society through design of new societal structures to address society’s problems and management from a broad perspective”. Academic areas are not necessarily specified, with the possibility for the development of environmental leaders in a wide variety of fields, not discriminating to humanities or sciences. The maintenance, achievement, improvement and development of the environment and sustainability of society are the expected contributions of the environmental leader.

## **3. Benchmark Topics for the State of Environmental Leadership Development Programmes in the World**

In order to research and analyse the mechanisms of environmental leadership development, this project designated master’s level courses and above as targets of research, acknowledging that postgraduate schools are the institutions charged with producing environmental leaders. Further, the “environmental leadership development programme” was defined as an overall mechanism for human resource development, including required course subjects and credits, skills and abilities to be mastered, and required experiential activities, as well as policies on admission of students, and expected areas of activity for talent developed.

It is difficult to make numerical comparisons on the state of environmental leadership development programmes; however, based on comparison of universities by country, it is possible to grasp characteristics of quality. For the purpose of comparison, this research determined several items to act as benchmarks and put emphasis on analysis of the content and extent of each. The eleven items below were presumed to be benchmarks. These are not considered finalised benchmark items, rather items that were chosen to determine common points of comparison in the interim, with plenty of room for future improvement.

- ① What kind of “environmental leader” does the programme try to develop? (What is at the forefront of the programme’s mission?)
- ② Programme’s year of establishment (On what era’s background was programme formation based?)
- ③ Characteristics of curriculum (division of humanities and sciences, or if combined, the approximate ratio of humanities and sciences)
- ④ The programme’s axial area of study within environmental studies (Upon what foundation is the programme constructed?)
- ⑤ Educational methodology utilised in courses (To what extent are adopted methods aimed at strengthening of communication skills, such as discussion, debate and group work, etc.? To what extent are field work and investigative research taking place to improve management abilities?)
- ⑥ Integration of participatory learning methods (To what extent are field work and internships included in programmes? What system is used for implementation of these methods?)
- ⑦ Ratio of mid-career learners in student body (Is the programme contributing to the development of work-ready talent, or is education of newly graduated university students at the forefront?)

- ⑧ System for mid-career learners to study while working (the extent to which evening courses, intensive courses, remote assistance for thesis writing, etc., are incorporated)
- ⑨ Contents of admissions policy (Is there an attempt to develop talented persons with a high level of expertise through requiring a certain level of knowledge, experience and skill from enrolled applicants? Or are doors open to a wide range of talent?)
- ⑩ What career fields are the chosen paths of new graduates? (What sector of society's needs is matched with the programme?)
- ⑪ Are social backgrounds and/or cultural foundations exerting any influence on programmes? (socio-economic conditions, etc., of countries and regions)

A literature review and interviews were conducted based on the benchmark items to determine the concrete image of the “environmental leader” held by the world’s universities. The research first examined the syllabi of environmental studies programmes of 30 universities in 15 countries, including Japan. Next, the subjects of investigation were narrowed to three universities in Japan, and nine programmes in of seven universities in other countries, where on-site research was conducted. Information was collected from multiple sources as far as possible, including websites, university publications, and interviews with relevant persons, and so forth.

Table 2: Summarises This Research

	USA		UK			Thailand			China	Japan		
	Yale University	Duke University	Oxford University	Newcastle University		Asian Institute of Technology	Chulalongkorn University		Tongji University	Nagoya University	Waseda University	Tokyo University
	School of Forestry and Environmental Studies (Master of Environmental Management, other)	Nicholas School of the Environment (Master of Environmental Management, Master of Forestry)	School of Geography and the Environment (MSc in Environmental Change and Management)	Law School (Environmental Law and Policy LLM)	School of Civil Engineering and Geosciences School (MSc in Environmental Engineering)	School of Environment, Resources and Development (Environmental Engineering and Management)	Environmental Management International Programme	Environment, Development and Sustainability Graduate School International Programme	Institute for Environment and Sustainable Development (Master's Programme in Environmental and Sustainable Development)	Graduate School of Environmental Studies/Graduate School of Engineering (Global Environmental Leaders Programme)	Graduate School of Environment and Energy Engineering	Graduate School of Frontier Sciences (Graduate Programme in Sustainability Science)
Image of Environmental Leader	Persons who make great contribution to the construction of a sustainable society domestically and internationally, and who possess both a global personage and a vision.	Persons who hold responsible roles in society; persons with foresight, awareness of environmental problems and their relevance to surroundings, and who possess values related to the environment.	Persons who are aware of environmental problems, devise solutions, and put these into effect in project work.	Persons with broad perspective and strong volition, who grasp problems related to the environment from an interdisciplinary perspective, and are able to take on environmental problems.	Persons who can design policy for and manage environmental problems.	Persons who have taken on leadership roles for the sake of economic development and sustainable development in the Asian region, in the areas of environment, resource management, poverty eradication, social economy and gender development.	Persons who possess both the knowledge and skills to manage the environment.	Persons who can handle issues related to the guarantee of human security from the standpoint of public policy and governance	Persons who collectively consider the balance between society, economy and environment, and who possess solid expertise, systematic thinking faculties, and organisational ability.	Persons who possess basic learning ability and practical abilities (academic ability, expert ability, knowledge of other fields, ability for practical application), and who are active in the field of environment both as policy makers and technical experts.	Persons who have good command of scientific and engineering methods, who take practical and strategic action; T-shaped and U-shaped type persons with the ability to act	Persons who examine societal systems as a whole, take into consideration the various elements concerned with sustainability, while maintaining a broad perspective and high level of problem solving ability, and who have the ability to make contributions to global sustainability.
Year Programme Established	1972	1991 (Env. Management in 1974)	1994	1963	2002	1991	2000	2008	2006	2009	2007	2005
Characteristics of Curriculum (Ratio of Humanities vs. Sciences)	Humanities and Sciences combined; Focus on practical experience (approx. 5:5 for Env. Management Course)	Humanities and Sciences combined; Focus on practical experience (approx. 5:5)	Humanities and Sciences combined (approx. 8:2)	Humanities focus (10:0, environmental law based in the humanities)	Sciences Focus (0:10, environmental studies based in the sciences)	Humanities and Sciences combined (varies by course from 4:6 to 2:8)	Humanities and Sciences combined (approx. 2:8)	Humanities and Sciences combined (approx. 9:1)	Humanities and Sciences combined (approx. 6:4)	Humanities and Sciences combined (approx. 2:8)	Humanities and Sciences combined (approx. 4:6)	Humanities and Sciences combined (approx. 5:5)

	USA		UK		Thailand			China	Japan			
	Yale University	Duke University	Oxford University	Newcastle University		Asian Institute of Technology	Chulalongkorn University		Tongji University	Nagoya University	Waseda University	Tokyo University
	School of Forestry and Environmental Studies (Master of Environmental Management, other)	Nicholas School of the Environment (Master of Environmental Management, Master of Forestry)	School of Geography and the Environment (MSc in Environmental Change and Management)	Law School (Environmental Law and Policy LLM)	School of Civil Engineering and Geosciences School (MSc in Environmental Engineering)	School of Environment, Resources and Development (Environmental Engineering and Management)	Environmental Management International Programme	Environment, Development and Sustainability Graduate School International Programme	Institute for Environment and Sustainable Development (Master's Programme in Environmental and Sustainable Development)	Graduate School of Environmental Studies/Graduate School of Engineering (Global Environmental Leaders Programme)	Graduate School of Environment and Energy Engineering	Graduate School of Frontier Sciences (Graduate Programme in Sustainability Science)
<b>Inclusion of Participatory Learning Methods</b>	Participation in research projects, field practicums; Internship (compulsory)	Participation in research projects, field practicums; Internship (compulsory)	Domestic and international field practicums, joint research with external organisations; Internships during the semester are not encouraged, but internships for master's thesis research are possible.	Joint research with external organisations; Internships during the semester are not encouraged, but internships for master's thesis research are possible.	Field practicums in the region, joint research with external organisations; Internships during the semester are not encouraged, but internships for master's thesis research are possible.	Participation in research projects, field practicums, internships, etc.	Participation in research projects, field practicums, internships, etc.	Participation in research projects; Internships recommended (but not integrated into curriculum).	Internships, etc.	Participation in research projects; Internships (possible to approve for credit)	Short-term intensive programmes are conducted in cooperation with AIT and others in order to provide training on sustainability and action in Asia.	
<b>Percentage of Mid-career Learners</b>	Approx. 80%	Approx. 50%	Approx. 50%	Approx. 25%	Approx. 50%	Approx. 70%	N/A	N/A	Approx. 20 % (2006, 2007), Approx. 60 % (2008)	N/A	N/A	N/A
<b>Structural Considerations for Mid-career Learners</b>	Establishment of a one-year master's course geared toward mid-career learners (certain amount of relevant work experience and research achievements as conditions for obtaining degree).	On-line master's course offered for mid-career learners.	Possible to study while taking a leave of absence from work.	Part-time course established to make it easier for mid-career learners to undertake.	Part-time course established to make it easier for mid-career learners to undertake; Programme structure in both linear and block types; Introduction of distance learning.	University itself is considered a training facility for mid-career professionals, particularly from developing countries in Asia; Certificate of completion may be obtained for short-term courses.	N/A	Classes offered in evenings.	Professional experience given consideration in admissions.	A special admissions examination is available for a few mid-career learners with 2 years or more work experience after completion of most recent study. (At the time of application, applicants must be working and may not be full-time students.)	A special admissions examination is available for a few mid-career learners with 2 years or more work experiences after completion of most recent study, who will return to work at the same institution after completion of the course.	Possible to study while taking a leave of absence from work.

	USA		UK			Thailand			China	Japan		
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Social Background and Cultural Foundations	Influenced by country's nature preservation policy. High social mobility of human resources. Development of work-ready human resources in accordance to society's needs. Development of high-level university education business for the purpose of developing high quality human resources.	Founded with nine billion yen donation from Duke alumni and Boston industrialist Peter M. Nicholas. Due to substantial ocean-related research facilities, ocean-related (natural sciences) research activities are extensive.	Adheres to traditional higher education for deepening of knowledge and learning of concepts. Focus is not on training professionals for society, but on education striving to raise the academic level of students.	Programme was founded by inclusion of environmental law and environmental policy into traditional law programme, based on rising research needs in environmental fields related to law.	In order to conduct a programme corresponding to society's needs, close cooperative relationships with local society have been built and maintained.	Higher education research institute founded upon the goal of promoting technological improvement and sustainable development in the Asia-Pacific region. Establishment of new research areas and improvement of current research areas conducted as appropriate based on socioeconomic needs of the Asia-Pacific region.	Research and education activities carried out as a part of nine research bases founded with the aim of development of domestic scientific technology. Environmental Management subjects were added to existing engineering field. Providing a domestic programme of high quality equal to that of overseas programmes.	Programme founded with the purpose of skill-building for students with work experience. Due to the advantage of geographical location near many international organisations and NGOs, it is possible to undertake practical on-site training.	Founded upon increasing international need for education in the field of "environment for sustainable development", toward solutions to environmental problems faced by developing countries, particularly in the Asia-Pacific region.	Environmental programme possible due to strong cooperative relationships existing between departments, a distinguishing characteristic of this comprehensive university. The Nagoya University Center for Global Environmental Leaders was founded to manage the programme.	Programme was founded to foremost conduct practical education aimed at cooperation and regional revitalisation toward solutions to regional environmental problems.	Programme founded opportunely with the establishment of the Integrated Research System for Sustainability Science (IR3S) and the comprehensive move to the Kashiwa campus.

#### **4. Overall Topics for Comprehension of Environmental Leader Development Programme Systems**

Keeping in mind the aforementioned benchmarks, the summary of research results is organised in Section 5 and latter sections based on the following topics:

- Curriculum design
- Core subjects of programme
- Educational approaches
- Internship programmes
- Admissions policies
- Paths of graduates

#### **5. Curriculum Design**

Curriculum design takes place as a matter of course when new environmental leader development programmes are created. Research results show that curriculum design often takes place when existing curriculum is rearranged to revolve around “environment”. Discussion among related persons in the school, particularly staff taking part in teaching, is the most common process by which this type of curriculum design takes place. However, when programmes are built in cooperation with international organisations or other universities, said international organisations and universities actually participate in curriculum design.

In the USA and UK, the existence of tradition and experience in the curriculum structure of existing academic areas has led to a unique trial and error process for curriculum design, leading up to the establishment of today’s programmes. Current curriculum is not considered a finished work, rather appropriate improvements and reforms are expected based on the need for further reflection of societal needs. Curriculum design in developing countries in Asia involves studying pioneering precedents and making adjustments when creating programmes suited to the situations of each country, resulting in a latecomer advantage of sorts. Thus, curriculum compares favorably with that of Europe and the USA, and programmes run in English are seen to be future competition for European and US universities.

Curriculum goals at the postgraduate level, where development of environmental leaders is the objective, are the acquisition of broad knowledge, understanding and skills. Thus, most universities advocate providing programmes combining the humanities and sciences.

However, in actuality there are many variations of the combined humanities and sciences course model. In some cases, courses include both humanities and sciences subjects, or employ teaching staff with specialties both in the humanities and sciences. In other cases, students enrolled in programmes include those with backgrounds in both the humanities and sciences, and in yet other cases curriculum required for course completion includes compulsory subjects in both humanities and sciences. These examples show a trend evident in the relatively long history of the postgraduate schools of Europe and the US toward the establishment of the so-called “environmental studies” academic field, a trend also followed in newly started programmes in the inclusive academic area of environmental studies.

Distinguishing characteristics among countries can be found when analysing the axial area of study of programmes. For example, in the US, typical curriculums are grounded in the academic field of natural resource management. Whereas in the UK, curriculum in so-called traditional academic areas seasoned with the element of environment is mainstream. Likewise, in Asia, examples of environmental studies programmes built on an engineering foundation are numerous. For this reason, even if both lecture and practicum courses in the humanities and sciences are included in the curriculum, the relative weight given to each naturally differs among countries and university courses. Thus, the combined humanities and sciences model cannot be expressed as a simple model.

There are several merits to the combined humanities and sciences model. These include the development of a variety of talent via the same programme, the admission of students with undergraduate backgrounds in both the humanities and sciences, and the ability to openly plan the development of versatile all-around talent which exceeds that of conventional academic systems.

## **6. Core Topics of Programmes**

The content of programmes varies due to differing universities from which the programmes are produced. For example, an environmental studies curriculum arising out of forestry or natural resource management and one developing from engineering will have differing central educational content. For this reason, programmes aimed at developing environmental leaders are conducted in a variety of ways in each country, and thus common traits were not found. Current programmes rely on the curriculum design of each university, and no international consensus on setting common course subjects was found to exist at present. Examples exist of universities who, for the purpose developing environmental leaders, have established course subjects based on the keywords of the United Nations Millennium Development Goals and have made these subjects part of compulsory coursework.

While common core subjects were not found, many programmes have core subjects in the environmental sciences and natural sciences, as well as social science topics such as environmental economics, environmental law, environmental management, and so forth. Such course composition parallels the characteristics of the combined humanities and sciences model academic area of “environmental studies”.

## **7. Educational Approaches**

Regarding educational methodology, no considerable differences were found in educational approaches toward the development of ideal environmental human resources. In courses aimed at the acquisition of knowledge and concepts in a field of expertise, study of conventional theory and research techniques were required. Whereas in courses aimed at augmenting understanding of broad environmental knowledge and in sociology-type courses, methods such as discussion, debate, presentations, group work and so on, were adopted. All programmes revealed a trend toward requiring active involvement of students. While naturally much depends on the instructive perspective and skills of the teacher actually in charge, this type of education greatly differs from the “blackboard and chalk” style educational methodology common in the past. Further, many practicum courses are offered which give consideration to practical experience.

A variety of educational approaches are used in the process of developing ideal environmental talent. For example, even in the lecture courses of professors with strong preference for knowledge and concepts, debate and discussion are used a method of mutual learning between teacher and students. Other means include on-site study tours as part of courses, or on-site practicums and field work to provide something more concrete than acquisition of knowledge and skills. These means are recognised to also contribute to the development of communication skills.

Many examples are to be found of internship programmes aimed at acquisition of knowledge and understanding in problem-solving and improvement of management ability. Such internships are set up to produce usable work-ready persons for society, through acquisition of on-site experience during the period of study at university. Particularly in the mobile labour market of the United States, internship programmes have been actively adopted since the 1970s.

## **8. Internship Programmes**

All of the universities included in this study have adopted or are conducting internship programmes of one form or another. However, while some universities actively encourage internships by allowing acquisition of credits for them, yet others do not attach importance to internships from the standpoint of focusing on studies during completion of coursework. The level of importance attached to internships varies.

Internships are a system for currently enrolled students to gain work experience related to future careers or academic specialties. The purpose of internships is to arouse concrete awareness on starting work, and to assist in future career choice. Students can gain full-time or part-time work experience while enrolled in university or graduate school. Internships programmes are particularly successful in the US, where the labour market is increasingly mobile, and universities are called on to provide apprentice-like education necessary to starting work. Likewise, at Thai universities, which have strong relationships with external organisations, students participate in joint research through which they acquire practical experience.

Regarding the financial basis for internships, in most cases universities conduct programmes at their own expense. There are some cases of paid internships, however, even in the case of unpaid internships, the host institution naturally covers the labour costs of concerned personnel, and so forth. Further, in universities with established internship programmes, there is sometimes an organised consortium of some kind for pooling businesses to which students are sent. So-called educational consortiums are seen as effective in securing internship posts for students. Likewise, consortiums of multiple universities and international organisations have been formed as one way to enrich educational activities in Asian universities.



## **9. Admissions Policies**

Each overseas university has principles for accepting students, or the admissions policy, an explicit policy whereby students are recruited, such as weighing grades and leadership experience in community service activities heavily (US), or weighing undergraduate grades heavily (UK, China, Thailand). For popular universities, where students must be carefully selected from a large number of applicants, clear indication of the desired type of student ahead of time is effective in avoiding mismatches. Further, while acknowledging the significance of admissions policies, there are other factors at work in actual student recruiting. Thus, the admissions policy is but one condition of entrance. Particularly for graduate schools that do not consider prior academic experience and area of specialty as subjects of evaluation for admission, it is possible that admissions policies are nonfunctional.

## **10. Paths of Graduates**

Trends show students to be making the most of knowledge, research results and experience acquired in programmes in starting work or continuing with their educations. Main paths chosen by graduates include starting work at government organs (central and local), international organisations, businesses, non-profit groups and education/research organisations, as well as continuing education in doctoral courses and returning to former workplaces (in the case of mid-career learners). A variety of workplaces are chosen, from governmental organisations to industry. Most universities covered in this study are prestigious universities in their home countries, thus career paths in central government organisations and top-ranking companies were found to be a high trend.

Further, in some Asian countries, postgraduate education itself is sometimes considered to be skill-building or retraining for working professionals. For this reason, in the case international students from developing countries, as well as students in programmes in Thailand and China covered in this research, it was often the case that students were sent to undertake graduate school education by their institutions of employment, to which they returned after graduation. This sort of system is made possible by funding from governments both within and outside each country.

## **11. Other Topics**

The wealth of information retrieved for this research included other hints, which are organised according to the topics below.

- Alumni networks
- Scholarship programmes
- Acceptance of international students
- Tuition

## **12. Alumni Networks**

An alumni group has been set up for most programmes. In some cases, alumni networks have been formed as organisations for merely promoting friendship or obtaining donations to the university. Yet, in a number of cases, networks function as a type of social relations capital. Job recruiting at alumni meetings provides student support for entering society after graduation, and provision of host institutions internship is an example of participation in student education. In newly established Asian universities, the formation of alumni networks is recognised as an upcoming issue.

### **13. Scholarship Programmes**

Most of the universities have scholarship programmes set up. Some offer scholarships to students from the country of the university, while others have scholarships made available to international students from other countries. There are a wide variety of scholarships, including those provided by national and state governing bodies, as well as private ones covered by funding from foundations or donations. There are also relatively numerous examples of scholarship programmes set up by the universities and programmes themselves. Apart from scholarship programmes, there also exist systems for attending school using student loans in the US and other countries.

Many scholarships at Asian universities are based on government funding. Additionally, there are cases of scholarship funding from OECD countries to support the educational activities of international students from developing countries. Due to high tuition and difficulty in self-sufficiency at the universities of developing countries, it is common for students to aim to get numerous available scholarships.

### **14. Acceptance of International Students**

Universities in the US and UK have for many years been accepting students from abroad, thus have highly-developed programmes for hosting international students and numerous staff assigned to take care of them. As programmes are obviously conducted in the mother tongue of English, international students are required to have English language ability. Generally a very high score on the TOEFL exam (above 600) is required.

The Chinese and Thai universities included in this study conduct their courses in English. For this reason, a standard of English comprehension (approximately 500 or above on the TOEFL) is required for all, regardless of status as international student or domestic student. Further, many universities offer intensive English courses prior to entering programmes.

In Japan, universities conducting programmes in English have appeared, making it more and more possible for students from other Asian countries to consider not only European and US institutions, but also the potential of furthering their educations at Japanese universities. However, because Japanese universities have traditionally conducted education only in Japanese, a problem exists in the practical English skills of parties in charge of education, making it no simple task to conduct educational activities in English for international students. As not all teaching staff have undergone training in English, requiring them to conduct lectures and practicum in English is a very high hurdle to overcome. In examples of programmes conducted in English in Chinese and Thai universities, teaching staff from Europe and the US are brought in for short-term stays to support and instruct domestic teaching staff, providing opportunities for capacity development. In any case, it is of great importance that some kind of support system for university teaching staff be prepared.

### **15. Tuition**

Tuition in the United States is approximately 28,000 USD per year, which if combined with living expenses, makes necessary costs total 46,000 USD yearly. In the UK, there are two levels of tuition depending on student nationality, where tuition for students from the UK or the EU is approximately 4,000 to 6,500 GBP per year. Tuition for students from other countries is approximately 10,000 to 14,000 GBP per year.

In China, tuition differs for Chinese students and international students, where Chinese student tuition is 1,500 USD per year, and international student tuition is 5,700 USD. Thai universities do not make a distinction between the tuition of domestic and foreign students, with tuition setting ranging from 140,000 to 376,000 THB, depending on the university.

In Japan, tuition for national universities is just over 500,000 JPY yearly, and tuition for private universities, which differs between humanities and sciences courses, usually exceeds 1,000,000 JPY yearly. However, many examples can be found of universities that have adopted tuition reduction or exemption schemes or that promote acquisition of scholarships.

## **16. Differences in Environmental Leader Development Systems of Overseas and Japanese Universities**

Quite naturally, when conducting research based on the previously mentioned benchmark topics and the research topics set for this project, considerable differences can be seen in the circumstances of provision of environmental leadership development programmes. These differences may arise from national traditions and educational systems or socioeconomic conditions, or they may be a result of inventiveness or enthusiastic efforts. As such, differences are difficult to demonstrate based on quantitative assessment. Thus, this research will not aim to establish a method of evaluation based on indices or numerical values. Rather it will focus on differences between the conditions of Japan and other countries in particular differences manifest in environmental leadership development systems. This focus will reveal the distinguishing characteristics of environmental leadership development systems in Japan and overseas universities.

## **17. Distinguishing Characteristics of US Programmes**

In the background of programme establishment is the sequence of events by which environmental studies arose out of the historically significant academic areas of forestry and natural resource management and was refined. As a result of educational methodology reforms in university education, teaching methods rely not on mere lecturing, but also include ample participatory methods such as presentations, discussion, group work and so on. The fact that contribution to class is allocated a certain percentage in assessment of grades shows the importance attached to student participation. In regards to programme administration, top-ranking universities with large amounts of donations have an abundance of funds to install many highly competent staff aside from teaching staff, thus constructing a support system for university education. In the US, college education is an important factor in career formation, making university education into a high-level business. This can also be seen in the context that graduates are able to find work in accordance with their aspirations.

Importance is attached to experience in the US, where practical-type educational programmes, such as those that involve the acquisition of work-ready skills in the real world, are designed and created. The mechanism by which universities produce high quality human resources is generally established. University education has developed as a business, a system not seen in other countries, but unique to the US and accepted by society.

## **18. Distinguishing Characteristics of UK Programmes**

In the background of programme establishment is the way the unique academic areas of each school have been maintained, while adding the element of environment to create environmental studies. As master's programmes are generally completed over a short-term (one year), there is little time to spare in the nine months of coursework and three months of master's thesis preparation to finish the programme. For this reason, internships which divide up the term are not recommended, and students are requested to concentrate on courses during the period of study. On the other hand, because the length of course is short, it is relatively easy for mid-career learners to take leaves of absence from work to study, and universities encourage their enrolment. A particular academic background is not required as a condition of admission, and programmes aim to educate persons of various talents. Effort is put into securing excellent students in each field, thus superior grades from institutions of higher education are regarded as the most important factor in admissions screening. In regards to programme administration, the near entirety of expenses depends on tuition, and funding from national governments or industry is rarely utilised. Graduates select a variety of career paths, such as positions at research institutions, government, business, NGOs and so on.

In the UK, the environmental perspective was added on to the traditional academic system to construct the education programmes, with the aim of developing talented persons capable of participating actively in the real world as experts in their respective fields. Again, mechanisms have been adopted which make short-term intensive study possible for mid-career learners.

## **19. Distinguishing Characteristics of China's Programmes**

Tongji University has set up its programmes with environmental management central to curriculum, based on the university's background in environmental science and environmental engineering. The programme itself was built with the cooperation of the international organisation UNEP and a consortium of participating universities founded by Tongji University. Likewise, curriculum design near to an international standard has been carried out since establishment, making this programme's roots very different from that of other Chinese universities. The programme is designed to develop talented persons to respond to pressing environmental problems faced by China and developing countries in Asia and Africa. Methods cover not only mastery of knowledge and concepts, but also include participatory education with import attached to presentations and discussion, comparing favorably to European and US programmes on this point. However, in terms of programme administration, cooperation from other universities, particularly those participating in the consortium, is indispensable. This situation has resulted in the need for improvement of the capacity of the university itself. Likewise, difficulty is faced in administering a programme in English in a country that is not English-speaking. Overcoming these difficulties is an issue, but for the time being plans are to continue programme administration as is.

## **20. Distinguishing Characteristics of Thailand's Programmes**

In Thailand, program formation has occurred in two ways. First, there are cases where social science related topics were added to the parent areas of engineering and the sciences in programme formation. Second, there are cases where programme formation resulted in comprehensive environmental studies with a combined humanities and science model. In the case of the former, enrolled students are limited to those with degrees in engineering and the sciences, while for the latter, acquisition of a specific degree is not a condition of

matriculation. Programme development and administration rely heavily on budget measures from the government. Programmes are conducted entirely in English, and ongoing training in acquisition of the latest knowledge, thesis writing and project execution is provided to both faculty and students to ensure support and expansion of high quality educational research. Various efforts regarding faculty are called for, including hiring of full-time English lecturers, bringing in of faculty from Europe and the US, international recruiting of faculty, active enactment of joint projects with external organisations, and so on. These methods form a part of efforts that are made from within the university toward improving the quality of research education and performance capacity. Securing funding from external organisations makes considerable contribution to improving research results. Securing funding also leads to the acquisition of even more external funding, thus is encouraged. Provision of scholarships increases the potential for students to participate in postgraduate education programmes, thus leading to greater opportunities for education. A mechanism is in place by which mid-career learners, most of whom are sent by their employers to participate in programmes, return to their places of work after graduation. There is recognition that development of talent improves both the organisation and the person him or herself.

In summary, programmes in Thai universities are developed relying on budget measures from government. Efforts to make progress in the development of environmental leaders take place contingent to the country's consistent policy to promote the internationalisation of Thailand and the development of talent within Thailand that can function internationally.

## **21. Distinguishing Characteristics of Japan's Programmes**

Many environmental leader development programmes in Japan were born and developed out of the academic areas of engineering and the sciences. The field of engineering in Japan has traditionally focused on practical learning. Further, engineering in Japan has already made great technological contributions to environmental protection and is expected to contribute to future expansion of the academic field and technological development. This background reveals the primary factors influencing the creation of environmental studies focused on engineering. Currently, Japanese institutions are aiming to create "environmental studies" or "sustainability studies" programmes that are not partial to engineering alone. Curriculum design is taking place particularly for interdisciplinary joint humanities and sciences programmes. Most programmes related to development of environmental leaders were established with short-term government funding in the early stages. Educational programmes that attach importance to both teaching academic knowledge, as well as experience via field work and internships, have also become available. Development of leadership skills is also taken into consideration. However, while students naturally participate in exercises and experiments, student contribution to courses, alike to that of Europe and the US, is still in the trial phase. Issues include the problem that programmes are administered by a relatively small number of teachers, causing programme bases to be weak. Again, while there is acknowledgement of the importance of administering programmes in English, realisation of this ideal is very difficult due to the present state of teachers' English ability.

From the above explanations, it is evident that Japan is making good use of its comparative advantage in engineering environmental technology, and promoting the creation of environmental studies and sustainability studies. As an extension of these efforts, Japan is advancing efforts to develop environmental leaders.

## **22. Direction Japan Should Take Based on Comparisons**

Based on results of research and analysis, it was determined that Japan should aim neither for the US or UK model, nor a compromised version of these models, when planning for future improvement of environmental leadership development programmes. Rather, Japan should gear its programmes to enhance education in Asia where lacking, and further pursue the advantages and strengths of the Japan model. Thus, below is organised a summary of approaches to development of environmental leaders and future courses for this development in Japan.

## **23. Approaches to Future Environmental Leader Development**

The “environmental leader” is not a person who can be described as one type, rather refers to a person of talent who holds a high level of knowledge and experience in a variety of fields, such as the sciences, technology, or policy, and who is capable to perform a leading role. As such, there are many images of the environmental leader, and a variety of programmes at the postgraduate level are being started up around the world towards the development of environmental leaders. In Japan, pioneering educational programmes are being tested with the plan of developing environmental leaders who can be active both domestically and abroad. It is expected that efforts such as these will further diversify and programmes will become further stratified.

There needs to be a balance in the development of a variety of talent to be environmental leaders. Several types exist. For example, there are persons with an augmented understanding of specific academic fields, who are T-shaped type persons with expertise on the vertical axis and broad knowledge on the horizontal axis. There are  $\pi$ -shaped type persons possessing comprehensive expertise in two areas, and U-shaped type persons who have integrated both engineering and scientific technique. For this reason, it is not appropriate to present any specific model for environmental leadership development programmes. Rather, it is recommended that each graduate school continue efforts to make good use of its respective strengths in programme formation and application.

However, in order to achieve a good balance in the development of talent to take charge of the field of environment for future generations, cooperation from several parties must be achieved. Related government and ministries, such as the current government administration, the Ministry of Environment, and the Ministry of Education, Culture, Sports, Science and Technology, must work in cooperation, with participation from contributing universities as well. It is necessary for all parties to share a common strategy for development of environmental leaders and a long-term perspective. It is important for government and ministries to not work only within the limits of the vertical divisions of their respective jurisdictions. Rather, they should combine the potential work of each and set strategic goals for continued work in the development of environmental leaders.

Environmental leadership development programmes, while maintaining a core focus, need to practice methods such as on-site research projects, in which a variety of experts learn together through on-site problem discovery, application of countermeasures, as well as problem-solving education in the field, and so on. Due to the strength of its engineering field, Japan needs to focus on this comparative advantage while also promoting combined humanities and sciences model programmes, to develop talented persons who can be active internationally.

As leaders, these talented persons require not only mere knowledge and skills in the field of environment, but also the language and communication skills necessary for participation in international conferences. As such, a system for including English study in programmes is necessary, in which students go into the field internationally to learn realistic English.

In order to produce a variety of talent, development of environmental leaders not only in Japan, but in all of Asia, is an issue. As such, it is necessary to create and devise programmes targeted at international students. However, there are currently cases of international students with low-level English ability, and those without sufficient preparation in a specialty field at the undergraduate level. If the quality of enrolled students is not very high, efficient development of superior talent is not possible. As the re-education of such students at the postgraduate level is difficult, it is plainly necessary to deliberately select persons to be accepted. Therefore, the application of an admissions policy suited to these conditions is recommended.

It is also recommended that each university do more than administer its own individual environmental human resource development programmes. For example, universities could join together with JICA training programmes. Likewise, construction of a system whereby previously selected persons from developing countries are hosted by universities for a short term could be planned as an extension of JICA training programmes. Such efforts would be effective in the efficient development of environmental leaders in Asia.

Regarding the future path of graduates, or places where environmental leaders are to be active, there is a need for comprehensive strategy or planning on the part of society to increase options for graduates, including addressing the difficulty doctoral course graduates face in finding work. Furthermore, evolution of new cooperative relationships between industry and academia are necessary to further education for environmental leadership development, which is quite different from conventional technological development. It is important for society as a whole to work together to lay the groundwork to address this issue.

While on the one hand criticism from industry claims that university education does not have direct bearing on work performance in society, acquisition of new knowledge and skills by current on-the-job education alone is also difficult. As such, it is important that working members of society, who wish to retrain or increase knowledge and skills in the environment, be actively accepted into programmes. From this perspective, programmes should seriously consider designating a fixed percentage of working students to be targeted for environmental leadership development.

Measures for development and administration of programmes related to environmental leadership development must also be given consideration. While funding from government is provided in some cases, following the designated period of funding, programmes face difficulty in expanding programmes and maintaining numbers of students and faculty. In order to increase numbers of students and faculty and administer sustainable programmes, continued independent efforts and active support from the national government is anticipated.

## Chapter 2: Assessment of the Current Status of the Environmental Leadership Training Programmes in the World

In order to assess the current status of the environmental leadership training programs both in Japanese and overseas universities, 10 universities were selected to conduct in-depth study of the relevant programs. Of those 10 universities, three were in Japan, two in the United States, two in the United Kingdom, two in Thailand, and in China. This chapter describes the report of the in-depth study conducted in Japan, and four other countries. For those four countries, the summary of the higher-education system has been included.

Table 3: List of Universities for on-sight Interview (Domestic)

Name of University and Graduate School (Name of Programme and Faculty )
University of Tokyo, Graduate School of Frontier Sciences, Programme in Sustainability Science
Nagoya University, Global Environmental Leaders Programme
Waseda University, Graduate School of Environment and Energy Engineering

Table.4 List of Universities for on-sight Interview (Overseas)

Country	Name of University and School
US	Yale University, School of Forestry and Environmental Studies Duke University, Nicholas School of the Environment and Earth Sciences
UK	Oxford University, School of Geography and the Environment Newcastle University, Law School (graduate school) Newcastle University, School of Civil Engineering and Geosciences
China	Tongji University, Institute of Environment for Sustainable Development
Thailand	Asian Institute of Technology Chulalongkorn University



## I. University Research in Japan

### ■ Programme in Sustainability Science, the University of Tokyo Graduate School of Frontier Sciences

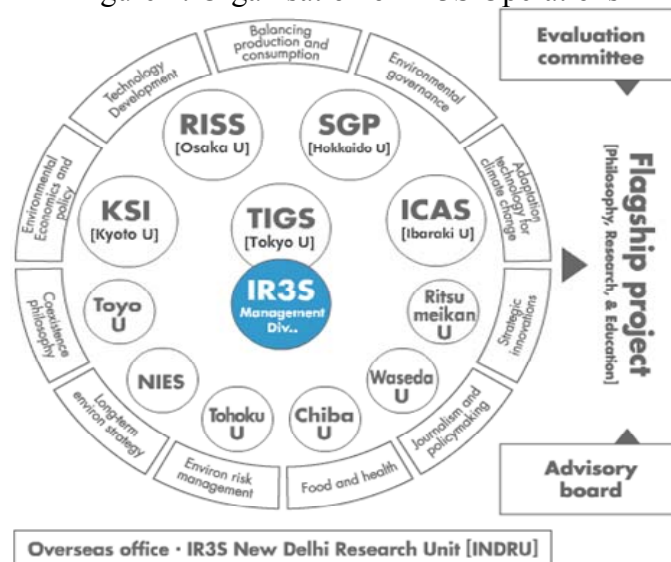
#### 1. Outline of Graduate School

##### (1) Background of Establishment

The Graduate School of Frontier Sciences of the University of Tokyo was founded in 1999. Through 2005, six major courses were scattered at different locations around the Hongo Campus, advancing the enrichment of research and education content in each field, and the standardised development of environmental studies. With the comprehensive move to the Kashiwa campus in April of 2006, the environmental studies departments unfolded a new design and were reorganised into the five specialisations of natural environmental studies, environment systems, human and engineered environmental studies, socio-cultural and socio-physical environmental studies, and international studies. The programme in sustainability studies was established to traverse the five specialties and aims for students to master a broad range of necessary knowledge and basic concepts required for any attempt to construct a sustainable society.

The founding of the Integrated Research System for Sustainability Science (IR3S) set the context for the establishment of the programme. IR3S is composed of the Planning and Administrative Headquarters and the research centres of five participating universities. Programme administration is performed by the research centre of the University of Tokyo, the Transdisciplinary Initiative for Global Sustainability (TIGS) (figure.2).

Figure 2: Organisation of IR3S Operations



Reference: Integrated Research System for Sustainability Science website (<http://en.ir3s.u-tokyo.ac.jp/ir3s>, Accessed 19, Mar, 2009)

The University of Tokyo organised the planning and administration for the IR3S (Integrated Research System for Sustainability Science), forming the research centres of the five participating universities, The University of Tokyo, Kyoto University, Osaka University, Hokkaido University and Ibaraki University. Combined with six cooperating institutions (Toyo University, Tohoku University, the National Institute for Environmental Studies, Chiba University, Waseda University and Ritsumeikan University), that take charge of separate research subjects, the IR3S is a global top-class research network in the field of sustainability science. The Planning and Administrative Headquarters was established as the main organisation for unification of the research centres of the five participating universities and the cooperating institutions. It is responsible for general planning and administration, administration of the collaborative flagship research projects, establishment and operation of a consortium of companies committed to sustainability, and outreach activities in society. It engages in planning and administration in consideration of the opinions of the Integrated Research Promotion Advisory Board established by the IR3S Executive Director and decides basic research and education policy and implementation plans. It establishes an internal Strategic Research Center Development Evaluation Committee and weighs the committee's evaluation results in the pursuit of new initiatives and directions.

## **(2) Aims of the Graduate School**

The Graduate School of Frontier Sciences aims to practice education and research toward the creation of new academic fields through integrated learning. In order to address the changing demands of modern society, the school aims to boldly meet the challenges of pressing issues for the human race. It strives to actively contribute to the realisation of a better society through the development of talented internationally-oriented persons who possess wide-ranging perspectives and high-level problem-solving ability.

The programme in sustainability science is a master's course that aims to train internationally-minded professionals to contribute to the formation of a sustainable society in a socially, culturally and economically diverse international society, as well as in the local communities that form a part of this society. Formation of a sustainable society here refers to the pursuit of sustainability on the differing spatiotemporal scales of people, society and the world, while working to create a new system by which people's quality of life can be maintained without harming the ecosystem, through attainment of intergenerational equity between present, next and future generations and rectification of inequalities between developed and developing countries like the North-South Divide.

Correspondingly, the programme not only provides knowledge related to various sustainability issues, but aims for students to acquire the necessary skills (systematic thinking and consensus-building) to propose new systems premised on solutions to these issues and to promote mutual understanding among diverse stakeholders. Toward this end, a unique educational methodology is practised that emphasises exercises related to concrete cases and mutual stimulation among diverse students and faculty. Furthermore, because measures that take cultural and geographical characteristics into consideration will be necessary to achieve sustainability on a global scale, educational activities are based on a strong awareness of current environmental and social circumstances, particularly in Asia.

This programme should develop persons that comprehensively perceive societal systems and give consideration to a variety of elements related to sustainability. Concurrently, these persons will possess the ability to contribute to global-scale sustainability through working in the field on the regional level to solve problems related to the environment and sustainability.

Problems related to sustainability cannot be solved by treating the symptoms. A turn in a better direction can only be achieved by consensus-building based on consideration of various elements, leading to the proposal of new systems. Therefore, persons of talent are needed who, in addition to possessing an understanding of various matters of sustainability, can contribute to rectification of the communication gap that arises between fields, regions and generations due to differing languages. Further, such persons should also possess the skills to utilise diverse methods to achieve consensus.

The programme is targeted at persons with backgrounds in a variety of fields who have a broad interest and curiosity in the environment, both new university graduates and persons with work experience. Further, superior talent is recruited not only in Japan, but from around the world. Through mutual understanding and stimulation in courses and research, education and research of an international quality is unfolded.

### **(3) Basic Tenants on Education and Research**

All lectures and practical work is conducted entirely in English, and a Masters of Sustainability Science is awarded to those completing the course. The programme aims for students to not only master the basic knowledge and concepts needed to work toward construction of a sustainable society, but also to acquire knowledge and skills useful for practical application. Accordingly, students engage earnestly in issues related to sustainability through practical exercises designed to install various skills via experience, whereby mutual stimulation takes place between students of differing backgrounds.

#### (4) Numbers of Academic Staff and Students

Academic Staff:	3 full-time (1 associate professor, 1 project associate professor, 1 project assistant professor) 6 concurrent posts (5 professors, 1 associate professor) There are also 10 to 15 other cooperating instructors.
Students:	23
International Students:	18
Male-female ratio:	3 to 7
Age range:	20s to 40s

Table 4: Nationalities of Enrolled Students (2008)

Country of Origin	Number of Students
Japan	5
Indonesia	3
Bangladesh	2
China	2
Philippines	2
Azerbaijan	1
Bolivia	1
Chile	1
Ethiopia	1
Jamaica	1
Nepal	1
Slovakia	1
Sri Lanka	1
United States of America	1

While international students from the Asian region are comparatively numerous, there is great variety in nationalities. In the admissions selection process, no special heed is given to attaining a balance of students by continent or nationality. Anyone in the world is a target for recruiting, thus there are no frameworks for differing examinations for Japanese and international students. Most international students utilise Ministry of Education, Culture, Sports, Science and Technology scholarships.

#### 2. Image of Ideal Talent (Environmental Leader Concept)

In order to address the changing demands of modern society, the programme aims to develop human resources to boldly engage pressing issues facing the human race. Persons should comprehensively perceive societal systems and give consideration to a variety of elements related to sustainability. They should possess a perspective which spans many fields and high-level problem-solving skills. They should have the ability to contribute to global sustainability through solving regional problems related to environmental and sustainability issues in the field. Further, persons of talent are needed who, in addition to possessing an understanding of various matters of sustainability, can contribute to rectification of the communication gap that arises between fields, regions and generations due to differing languages. Further, such persons should also possess the skills to utilise diverse methods to achieve consensus.

The following are examples of cases where the above talent could utilise skills.

- Getting involved through international organisations in resolution of various problems related to clashes of interests of different nations and regions.
- Performing coordinating roles in the field to ensure that aid given to developing countries is contributing to their sustainability.
- Contributing through local authorities, businesses and NGOs to the proposal of new, more sustainable systems by objectively organising relevant information and opinions of concerned parties in solutions to environmental problems with conflicting interests (fulfilling the role of facilitator in consensus-building).
- Approaching the formation of future industry strategy, or decision-making in the start up of new businesses, with consideration of sustainability not only from the perspective of economic factors, but also from a broad perspective including societal relationships, and by contributing to businesses fulfilling social responsibilities.
- Providing expertise which utilises the concept of sustainability in management strategies for implementing tasks such as environmental management, monitoring and assessment at environmental consulting companies, accounting offices and other workplaces.

The following are examples of skills to be developed.

- ① Practical skills (the ability to set people and projects into motion)
  - ◆ Coordinating ability
  - ◆ Communication skills
  - ◆ Leadership
  - ◆ Action skills
  - ◆ Management ability
  - ◆ Ability to respond to problems
- ② Other
  - ◆ Encompassing perspective...ability to comprehend the environment as a whole
  - ◆ Ability to present and create a vision

### 3. Educational Curriculum

#### (1) Outline of Educational Curriculum

Table 5: Outline of Educational Curriculum

Programme title	Programme in Sustainability Science
Degree	Master's (Sustainability Science)
Conditions of completion	Acquisition of necessary credits
Length of study	two years
Credits	

Courses designated as compulsory option courses form the core of the programme, and students are required to complete 12 or more credits from these courses. Four or more of these 12 credits must be fulfilled by courses in the “Experiential Learning and Skills Oriented Practical Courses” category.

## **(2) Distinguishing Characteristics of Curriculum**

A distinguishing characteristic of the curriculum of this school is its education geared to teach knowledge and skills to help graduates contribute to the construction of a sustainable society as professionals. This unique curriculum focuses on lectures that broadly impart knowledge and concepts as well as practical exercises.

The curriculum is made up of “Knowledge and Concept Oriented Courses”, “Experiential Learning and Skills Oriented Practical Courses” and the master’s thesis.

### **◆ Knowledge and Concept Oriented Courses**

The “Knowledge and Concept Oriented Courses” have reorganised subjects that are particularly important from the perspective of sustainability. These subjects were selected from a wide range of academic fields spanning humanities and sciences, which have heretofore been part of environmental studies. In addition, a thorough curriculum is offered to provide the necessary coursework for sustainability through cooperation with the Transdisciplinary Initiative for Global Sustainability, which was set up by Tokyo University to establish its sustainability science programme. These courses allow students to master the necessary foundational knowledge and concepts to work towards the construction of a sustainable society.

### **◆ Experiential Learning and Skills Oriented Practical Courses**

The “Experiential Learning and Skills Oriented Practical Courses” do not merely provide education on knowledge alone, but offer a unique curriculum which emphasises practical exercises to acquire various skills related to sustainability via experience. This coursework includes a wide range of experience on a variety of case studies related to international cooperation and environmental problems. Students gain training in systematic thinking to comprehensively conduct accurate assessment of situations, acquire facilitation and negotiation skills necessary for consensus-building, and develop an international consciousness and understanding of cultural diversity to work responsibly in the international arena. A diverse group of students from differing specialisations and cultural backgrounds engage earnestly in challenging practical exercises in which they master practical knowledge and skills through mutual intellectual stimulation.

One distinctive programme is the Intensive Programme on Sustainability (IPoS). This programme is a short-term course targeted at university students, particularly those from Asia. Training is conducted on appreciation of and action towards sustainability in Asia and the world. Students participate in experience-based learning through a combination of workshops, field work and lectures, and interact with other students of diverse cultural backgrounds and academic specialties through joint project work and communal living arrangements. Each year a common topic related to sustainability is determined. Students augment their expanding cogitative abilities through use of local facilities in the community, where they engage in discussion on sustainability in the community while relating this discussion to global sustainability. From 2004, the programme has been held once in the summer term organised by the University of Tokyo and the Asian Institute of Technology (AIT). Since 2006, grants from IR3S and the Nissan Science Foundation have supported the NISSAN Workshop in IPoS, aimed to provide follow-up to the summer term IPoS. This follow-up session is held for about one week in the winter in the Yokosuka-Kamakura area. In 2007, activities continued to expand as a wider range of participants were recruited. In addition to the University of Tokyo and AIT, participants came from the Alliance for Global Sustainability (AGS) member

institutions of Massachusetts Institute of Technology and Chalmers University of Technology, the IR3S participating universities of Hokkaido University, Ibaraki University and Kyoto University, as well as the National Taiwan University, the National Cheng Kung University (Taiwan), and the Australian National University.

◆ Master's Thesis

The master's thesis on sustainability science research is compulsory. Research topics are determined based on discussions with instructors. The topic can go beyond merely proposing solutions to environmental problems, and students have the potential to select topics outside existing academic frameworks. They can engage in research which applies integrated and holistic approaches to specific topics related to sustainability, or engage in research to propose new systems, institutions, values and paradigms towards construction of a sustainable society.

**(3) Course Topics**

- Students enrolled in the sustainability science programme must complete 30 or more credits, including 12 or more credits of compulsory option subjects (including at least four credits in practical experience subjects), Sustainability Science Seminars I, II, and III, and Sustainability Science Research.
- A limit of four credits from subjects of other academic faculties, other specialties and other research departments, or of the education faculty, can be applied to the master's programme.

Table 6: List of Course Topics

Knowledge and Concept Oriented Courses				
Term	Compulsory / Optional	Subject	Class format & Method of assessment	Number of credits
	Compulsory	Seminar Courses on Sustainability Science I-IV(*)	literature review, research proposal preparation/presentations and debate in research meetings with instructors, presentation of results at programme presentation meetings	
	N/A	Special Lecture on Sustainability Science	project work, presentations, discussion/homework (30%), take-home examinations(30%), project report (written 20%, oral 20%), class participation	
	Option	Sustainability Perspectives in Environmental Issues	lectures/attendance (30%), 3 reports (70%)	
		Environmental Economics	lectures/attendance, reports	
		Environmental Business	lectures/attendance, reports (3)	
		Natural Environmental Studies for Sustainability	lectures/attendance (40%), reports (60%)	
		Innovation and Sustainability	lectures/attendance (50%), reports (50%)	
		Urban Sustainability in Relation to Water Sector	lectures/attendance (30%), reports given at lectures (40%), final term topic report (30%)	
		Strategies for Global Sustainability	lectures/attendance, reports	
		Environmental Sustainability	lectures/presentations in overall debates (30%), written examination (take home or open book) (70%)	
		Bio-environmental Studies	lectures/written examination, reports	

		Sustainability Education	lectures, case study research/short reflection paper (50%), case study research report (50%)	
		Development Model	N/A	
		Socio-environmental Systems	lectures/ first half (50 points max): attendance (30%), case topic research/presentation (40%), discussion participation (30%) second half (50 points max): attendance (20%), case topic research/presentation (40%), discussion participation (20%), report (20%) <u>report topic</u> : developing power-point slide and text teaching materials for junior high school students regarding global warming	
		Design of Environmentally Harmonising Systems	research, analysis, presentations/ attendance, presentations	
		Marine Resource and Environment	lectures/written examination (100%)	
		Business and Finance for Sustainable Development	lectures/attendance, reports	
		Coastal Environment Infrastructure Studies	lectures/reports (2), written examinations, attendance	
		Advanced Wind Engineering	lectures/topic reports (2), independent topic report	
		Water and Wastewater Treatment for Material Recycling	lectures/attendance, reports	
Experiential Learning and Skills Oriented Practical Courses				
	Option	Case Study Course on Sustainability Science	discussion, proposals, role-playing/attendance (50%), results of practical exercises (50%)	
		Practical Course on Systems Thinking and Consensus-building	discussion/attendance, degree of contribution, reports	
		Seminar on Environmental Politics and Policy	presentations, discussion	
		Project on Environment Systems	field work	
		Intensive Practical Course on Sustainability	workshops, field work, lectures/communication, degree of contribution, final presentation	
		Internship on Sustainability Science	internship	
		Special Practical Course on Sustainability Science	debate, literature review/debate in research meetings with instructors, literature review results	
	Compulsory	Research on Sustainability Science (Master's Thesis)	presentations, master's thesis/ master's thesis, presentation of master's thesis at presentation meetings	

\*In the Seminar Course on Sustainability Science I and II, students master the necessary foundational knowledge and research techniques to conduct master's thesis research, while beginning their preparatory research. Further, by engaging in debate at research meetings, students learn a variety of ways of thinking about sustainability, as well as debating and facilitation techniques. In the Seminar Course on Sustainability Science III, students



implement research plans made in Seminars I and II, including on-site research and social experiments when applicable to research content. In the Seminar Course on Sustainability Science IV, students continue and complete research carried out in Seminars I, II and III. Final compilation of research is conducted, leading to the master's thesis.

#### **(4) Distinguishing Characteristics of Educational Methodology**

While acknowledging that the university is basically a place for teaching knowledge and concepts, the programme also acknowledges that interpersonal skills are indispensable if a sustainable society is actually to be built from diverse modern society. To this effect, curriculum is designed to expand knowledge in Knowledge and Concept Oriented Courses and to augment interpersonal skills in Experiential Learning and Skills Oriented Practical Courses. For this reason, the former is comprised of nearly all lecture courses where students can concentrate on mastering the knowledge and concepts which will act as the foundation of master's research. However, there are also subjects, such as "Design of Environmentally Harmonising Systems", which include a strong focus on practical exercises. Students in this course engage in analysis and planning from the viewpoints of society, economy, environment and technology, through collection of basic information and data, group work and discussions with the instructor. Further, even lecture courses include special lectures of visiting representatives of industry (e.g. Showa Shell) or the Ministry of the Environment of Japan, as well as industry study tours. The latter course category emphasises augmentation of interpersonal skills. Students acquire communication skills, presentation skills and planning skills through practical exercises in field work, workshops, role-playing and presentations. All courses are taught in English based on recognition of the essentiality of strengthening English ability to rectify the communication gap between fields, regions and generations, as well as to respond to the needs of international students.

Furthermore, as the main objective of the master's course is master's research (master's thesis), guidance for student research is begun as early in the course as possible. Guidance takes place in the "Seminar Courses on Sustainability Science", the "Special Practical Course on Sustainability Science" and through individual instruction.

#### **(5) Method of Course Assessment**

Methods of course assessment for students are various, including attendance, reports, presentations, written examinations, and so forth. The most commonly utilised methods are attendance and reports. One point worth mention is that there is a difference in the target of evaluation between the Knowledge and Concept Oriented Courses and the Experiential Learning and Skills Oriented Practical Courses, based on the differing objectives of each. For courses in the former category, the main trend is to evaluate attendance and reports, due to the fact that emphasis is placed on the level of understanding of knowledge and concepts. For courses in the latter category, results of practical exercises are comprehensively assessed, in addition to consideration given to degree of contribution and participation in class.

## **(6) Method of Academic Staff Assessment**

Standardised academic staff evaluation is conducted for all departments through student surveys each term, but method of feedback on results of surveys has not been systematised. At present, neither the graduate school nor the programme has a method of academic staff assessment of its own. However, as students in the programme are few, student opinions can be reflected in class in informal ways, and efforts are made to improve the quality of classes by responding flexibly to students.

## **(7) Method of Programme Auditing**

At present no audits of the programme are conducted.

## **(8) External Funding**

According to interview research conducted at the graduate school, IR3S receives 100 to 200 million yen of funding yearly from the Ministry of Education, Culture, Sports, Science and Technology as a part of funding for promotion of science and technology. These funds are divided between the five participating universities, but a breakdown of amounts is unknown. Further, Japan Science and Technology Agency (JTA) science and technology promotional funds are to be allocated for five years to the “Environmental Leader Programme”, newly established in 2009. In 2008, two special lecturer posts were established based on administrative fee grants of the University of Tokyo.

## **4. Relationships with External Organisations and Communities**

The programme aims to enrich content and produce talented competent human resources by utilising the established networks of IR3S and its precursor, the international partnership of universities called the Alliance for Global Sustainability (AGS) (established in 1996). Cooperation in class design (visits of part-time and special lecturers) is the main type of cooperation with external organisations and communities.

The programme curriculum is designed to span various fields, and cooperation in class design takes place between other research departments in the university. A cooperative system for credit transfer has been realised with IR3S participating universities of Chiba University and Ibaraki University. (Within IR3S, Kyoto University and Osaka University also have a system of credit transfer. Due to geographical and temporal factors, it is presently difficult for universities separated by long distances to realise credit transfer systems. E-learning methods have been considered, but have not been developed due to concerns regarding difficulty in conducting question and answer sessions.) Examples of cooperation with the business sector also exist. For example, Kazuya Matsuo, Director of the Matsuo Engineering Office, was asked to act as instructor of the “Environmental Business” course. In the past, guest lecturers have been brought in and on-site study tours have been conducted in cooperation with Showa Shell, a cooperating business in IR3S. Aside from the business sector, lecturers have also been brought in from the Ministry of the Environment. The network of AGS is also utilised. Special lectures have been held by professors invited from the Massachusetts Institute of Technology, and students from a master’s course of Chalmers University have visited. A cooperative effort called ProSPER.Net was established in June of 2008. This network is considering publication of a journal related to sustainability science, but details are still under deliberation.

At the present stage, relationships with external organisations are limited due to the fact that the programme was newly established in 2007. Future goals include establishing cooperative relationships with international organisations.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

Admissions screening examinations are made up of stage one selection (screening of documents), and stage two selection (first exam: English, second exam: oral exam). Students are judged comprehensively based on English, short essays, oral exams, research proposals (in English), letters of recommendation and transcripts from graduating institutions. As all courses in the programme are conducted in English, a certain level of English ability is required. English examination requirements are fulfilled through submission of TOEFL score sheets.

### **(2) Selection of International and Mid-career Applicants**

There is no particular framework in place for international students and mid-career learners; however, evaluation of international students living overseas is based solely on screening of documents as oral exams are not conducted. Students may be admitted twice yearly, in April and October. Recruiting for international students is basically the same as the open recruiting of Japanese students, but articles about recruitment are submitted to the Forum on Science and Innovation for Sustainable Development (U.S.A.) and the European Sustainability Science Group (Europe). Contact regarding recruiting is also made with AGS cooperating universities.

## **6. Student Futures**

### **(1) Paths after Graduation**

The first class will graduate in September of 2009.

### **(2) Methods of Network Building between Graduates**

If graduates can be sent to NGOs and international organisations, cooperative relationships can be built and strengthened between the university and these employers. From this standpoint, construction of a network among graduates and between graduates and the university is indispensable as the career paths of graduate influence future development of the programme and blaze a trail for later graduates to follow. The method under consideration is for the office to obtain and maintain employment and contact information on graduates.

## **7. Other**

### **(1) Internships**

At present, students use holidays or other periods to participate in internships, and the university does not conduct any internship programme with businesses or other organisations. It is possible that such programmes will be deliberated in future efforts to strengthen relationships with external organisations.

## **(2) Scholarship Programmes**

There are several scholarships that students of the programme can utilise, including Ministry of Education, Culture, Sports, Science and Technology scholarships, Asian Development Bank scholarships, as well as University of Tokyo ASATSU-DK China Scholarship Fund scholarships (targeted at all University of Tokyo students). At present, the only scholarship actually being utilised is the Ministry of Education, Culture, Sports, Science and Technology scholarship.

## **(3) Language Study**

The graduate school provides English support to students who are not native speakers of English. Teachers are brought in from English language schools, and free classes are offered according to student needs on communication, English for academic papers, business English, and so on. Further, academic staff can also participate.

## **(4) Japanese Language Free Paper “*Sustaina*” and the “Sustainability Science” Journal**

Since July of 2006, IR3S has issued “*Sustaina*”, a quarterly free paper. A variety of articles are printed, including features on the various projects of IR3S, serialised essays, serialised lessons, columns introducing research groups and young persons, as well as a section for children. Further, the journal “Sustainability Science” has been published since October of 2006 as an English-language international academic journal on the subdivided field-spanning area of sustainability science. It aims to develop as one of the main academic journals in the world related to sustainability science, through releasing of results of IR3S research and calls for cutting-edge research papers related to the field.

## **8. Future Issues**

The programme faces the following present and future issues.

Firstly, the definition of sustainability science is unclear. The programme pamphlet explains as follows,

Sustainability science is a new, transdisciplinary discipline destined to play a fundamental role in addressing critical global issues and developing visions that can lead to a sustainable global society.

Sustainability science is extremely broad and open to numerous interpretations. The defining of sustainability science and its establishment as an academic area is essential to realise the future plan of dispatching sustainability science from Japan to other parts of Asia and the world. Time and hard work is needed, but discussions should be expanded with the cooperation of educational groups and project groups toward further theorisation in the field.

Secondly, there are issues related to the future administration and development of the programme. As stated previously, the programme is currently administered by three full-time academic staff and six academic staff who hold other posts concurrently. At present, it is extremely difficult for staff to administer the programme and conduct IR3S activities due to personnel shortage. More staff is necessary for the future development of the programme. As sources of funding are necessary to secure personnel, this issue must be deliberated together

with programme administration methods following the end of Ministry of Education, Culture, Sports, Science and Technology funding.

Thirdly, there is the issue of path-finding for the careers of graduates. The programme needs to put emphasis on developing persons of talent who can elucidate societal needs and respond flexibly to them. This is an issue which involves expectations as the programme is yet to produce graduates. There are those of the opinion that the programme must strive to improve the quality of its teachers in order to develop talented persons to respond to the needs of society.

## **9. Summary of Research**

This programme possesses a unique curriculum made up of both lecture courses for broadly relaying knowledge and concepts, and practical experience courses that emphasise development of interpersonal skills. The programme aims to conduct education in knowledge and skills which will help students to contribute as professionals to the construction of a sustainable society. Further, it endeavours to train human resources that can contribute to the realisation of a sustainable society from an international perspective. As such, all courses are conducted in English and the international quality of the programme is developed through exchange projects with overseas university students in the IPoS scheme. Students deepen their understanding of sustainability from a variety of perspectives and on a variety of scales through participation in classes and overseas study. Consequently, the programme succeeds in developing the ideal talent it sets out to develop. This ideal is previously stated as, “persons that comprehensively perceive societal systems and give consideration to a variety of elements related to sustainability, and who possess the ability to contribute to global-scale sustainability through working in the field on the regional level to solve problems related to the environment and sustainability”. Further, this ideal image involves elements of the environmental leader, who will likely contribute to actual solutions to environmental problems in Japan and the world, and aid in the realisation of a sustainable society.

On the other hand, there are serious issues to consider. Firstly, in order to continue administration of the programme and plan the dissemination of sustainability science within Japan and other parts of Asia, the major issue of the unclear definition of sustainability science must be addressed. Defining sustainability science, an extremely new academic field which is yet to be established, will not be an easy task. Even further difficulties are faced when teaching in the field. Secondly, issues exist related to personnel and funding sources for future administration and development of the programme. The system of administration following the end of Ministry of Education, Culture, Sports, Science and Technology funding in 2010 should be deliberated and determined as soon as possible.

The first class will graduate in September of 2009. It is hoped that these graduates can gain a foothold for future programme development and contribute in the real world to the attainment of a sustainable society in line with programme aims.

## Appendices

### 1. List of Interview Subjects

<b>Name</b>	<b>Position</b>
Motoharu Onuki	Project Associate Professor, Graduate School of Frontier Sciences Graduate Programme in Sustainability Science (GPSS)
Akimasa Sumi	Integrated Research System for Sustainability Science Director of Transdisciplinary Initiative for Global Sustainability AGS Promotion Office Head Professor, Center for Climate System Research (concurrent post)
Masaru Yarime	Associate Professor, Graduate School of Frontier Sciences Graduate Programme in Sustainability Science (GPSS)

### 2. List of Reference Materials

- 2005 Pamphlet of the Intensive Programme On Sustainability (IPOS)  
2007 Pamphlet of the Intensive Programme On Sustainability (IPOS)  
2008 Pamphlet of the University of Tokyo, Graduate School of Frontier Sciences,  
International Studies Programme  
2009 Master's Course Application Materials, Graduate School of Frontier Sciences, Graduate  
Programme in Sustainability Science  
Pamphlet of the Graduate School of Frontier Sciences, Graduate Programme in Sustainability  
Science  
Pamphlet of the Transdisciplinary Initiative for Global Sustainability (TIGS)  
Pamphlet of the University of Tokyo, The Alliance for Global Sustainability (AGS)  
2009 Pamphlet of the University of Tokyo, Graduate School of Frontier Sciences, Division of  
Environmental Studies  
The Integrated Research System for Sustainability Science (IR3S) Quarterly Free Paper  
"Sustaina", No. 6 (January 2008)  
The Integrated Research System for Sustainability Science (IR3S) Quarterly Free Paper  
"Sustaina", No. 7 (April 2008)  
The Integrated Research System for Sustainability Science (IR3S) Quarterly Free Paper  
"Sustaina", No. 8 (July 2008)  
The Integrated Research System for Sustainability Science (IR3S) "Toward a Global  
Sustainability Strategy"

#### Websites:

- Ministry of Education, Culture, Sports, Science and Technology, Summary of Circumstances  
of Evaluation and Results for Funds for Promotion of Science and Technology 2007  
[http://www.mext.go.jp/b\\_menu/houdou/19/05/07051420.htm](http://www.mext.go.jp/b_menu/houdou/19/05/07051420.htm) (Japanese only)  
The Integrated Research System for Sustainability Science Website  
<http://en.ir3s.u-tokyo.ac.jp/>  
The University of Tokyo, Graduate School of Frontier Sciences, Graduate Programme in  
Sustainability Science Website  
<http://www.sustainability.k.u-tokyo.ac.jp/index.html>

## ■ Nagoya University Global Environmental Leaders Programme

### 1. Outline of the Programme

#### (1) Background of Establishment

In 2008, the Nagoya University Global Environmental Leaders project was selected for Ministry of Education, Culture, Sports, Science and Technology funding for the promotion of science and technology, as a “strategic base for development of environmental leaders” in the category of Strategic Promotion of Scientific and Technical Cooperation in Asia and Africa. Deliberations on the set-up and administration of the new programme were initiated in April of 2008. The time frame for the said funding is five years, from 2008-2012. The programme is scheduled to officially begin in April of 2009. Students are accepted into the Graduate School of Environmental Studies (Department of Environmental Engineering and Architecture) and the Graduate School of Engineering (Department of Civil Engineering), with the support of the Graduate School of Bioagricultural Sciences and the Graduate School of International Development.

#### (2) Aims of the Graduate School (the Programme)

In order to find solutions to environmental problems faced by the countries of Asia and Africa, the programme aims to develop environmental leaders who can comprehensively perceive and analyse problems from an international perspective, and who can propose concrete problem-solving methods. Further, it aims to produce talented persons who can contribute to solutions from both technological and policy approaches.

#### (3) Basic Tenants on Education and Research

As the programme aims to develop environmental human resource suited to the international arena, all lectures are conducted in English. Education and research are carried out based on existing academic areas (engineering, sciences, biology, etc.), while adding elements of environmental studies. Three areas of specialisation are offered, climate change mitigation and adaptation, water and waste management, and biodiversity conservation.

#### (4) Numbers of Academic Staff

Full time for the programme	2 professors 2 associate professors
Concurrent with Graduate School of Environmental Studies	5 professors 5 associate professors 1 visiting professor 1 visiting associate professor
Concurrent with Graduate School of Engineering	8 professors 4 associate professors 1 lecturer

## **2. Image of Ideal Talent (Environmental Leader Concept)**

The image of the ideal talent to be developed is, 1) persons from the Asian or African regions who are active as environmental leaders in their home countries and other places in the world (international students), and 2) persons who are active in international environmental cooperation around the world, particularly in the Asian and African regions (Japanese students). Specifically, the programme aims for this talent to be high-level experts, researchers and coordinators. Two required abilities for this talent are foundational scholarly skills (academic ability, expert ability) and concrete skills (knowledge of various fields, practical application skills).

## **3. Educational Curriculum**

### **(1) Outline of Educational Curriculum**

Degree obtained:	Master (Environmental Studies or Engineering)
Conditions for completion:	Acquisition of necessary credits
Period of study:	two to three years
Number of required credits:	30 credits

Curriculum is made up of a combination of existing curriculum and new curriculum to include the three areas of climate change mitigation and adaptation, water and waste management, and biodiversity conservation. Systematic education is conducted towards understanding the phenomena of problems, understanding and mastering of technological measures, and acquisition of organisational design and policy administration abilities. All lectures and student instruction is conducted in English.

In year one, students enrol in the lectures, seminars and practical exercises of the Graduate School of Environmental Studies and the Graduate School of Engineering to expand expertise in their selected study area. Depending on interests, students are allowed to take courses from the Graduate School of Bioagricultural Sciences or the Graduate School of International Development.

In year two, students enter into training or internships at companies, local governments, or international organisations in order to gain further knowledge in their selected study areas. (Japanese students undergo training or internships in developing countries, while international students undergo training or internships in Japan.) Master's thesis topics are dedicated to solving problems faced by the world. Students actively engage in research and information collection both in Japan and overseas in the process of thesis preparation.

The programme plans to award a Global Environmental Leaders Programme Certificate upon completion of the programme.

### **(2) Distinguishing Characteristics of Curriculum**

The educational curriculum is a combined humanities and sciences model including ample amounts of seminars and practical exercises (internships, etc.). Further, classes include discussion and presentation to emphasise the development of problem-solving and problem-coping skills, as well as international communication skills.



Likewise, the programme aims to achieve regional cooperation with industry, government and educational institutions in educational activities. Lectures of participating institutions in the Chubu Consortium for Environmental Leaders Development, as well as training and team research with these institutions, are pursued.

### (3) Course Topics (a selection only)

Table 7: List of Course Topics

Courses for Systematic Understanding				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
Term 2	Compulsory	Sustainability and Environmental Studies		2
Term 1	Compulsory	Field Seminar in Environmental Studies		2
Year 1, Term 1	Compulsory	Systems of Environmental Industry 1		2
Year 1, Term 1	Option	Low-carbon Urban Studies (global warming area)		2
Year 1, Term 1	Option	Water/Waste Engineering (water and waste area)		2
Year 1, Term 1	Option	Foundations of Ecological Environmental Resources (biodiversity conservation area)		2

Type 1 Courses (lectures)				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
Year 1, Term 2	Option	Analysis of Climate Change Mitigation (global warming area)		2
Year 1, Term 2	Option	Water and Waste Engineering (water and waste area)		2
Year 1, Term 2	Option	Policy for Biodiversity Conservation (biodiversity conservation area)		2
Year 1, Term 2	Option	Management of Biological Resources (biodiversity conservation area)		2
Year 1, Term 2	Compulsory	Systems of Environmental Industry 2		2

Type 2 Courses (seminars)				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
Year 1, Term 1	Compulsory	Environmental Leaders Seminar A	seminar	2
Year 1, Term 2	Compulsory	Environmental Leaders Seminar B	seminar	2
Year 2, Term 1	Compulsory	Environmental Leaders Seminar C	seminar	2
Year 2, Term 2	Compulsory	Environmental Leaders Seminar D	seminar	2

\*The above seminars are examples. Students undertake the seminars of research projects or of project professors (8 credits).

Type 3 Courses (practicums)				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
as required	N/A	Internship	practicum	1
Term 2	Option	Practicum in Biological Resource Management (biodiversity conservation area)	practicum	1

Research Instruction				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
N/A	Compulsory	Instruction in long-term internships and internship reports, and instruction in master's thesis preparation	N/A	N/A

#### **(4) Distinguishing Characteristics of Educational Methodology**

One characteristic of educational methodology is the application of systematic learning based on problem-coping and problem-solving models. Courses aimed at acquisition of the necessary qualities of an environmental leader are conducted, and debate (discussion), seminars and internships are included toward development of leadership skills. Participation in training at businesses and international internships is particularly encouraged, as emphasis is placed on mastering practical know-how through on-site experience.

#### **(5) Method of Course Assessment**

##### **Example**

##### **Field Seminar in Environmental Studies**

Course content: Three on-site tours are conducted. Prior to each visit, preparatory instruction and debates are conducted in the classroom. Students enrolled in the course are in charge of conducting a pre-visit investigation regarding one of the locations and presenting this content at the preparatory debate. After on-site tours, each person compiles and submits a report on his or her opinions and impressions.

Method of assessment: Attendance at seminars (50%) (As a rule, students must attend at all three on-site tours.), pre-visit investigation (20%), post-visit reports (30%)

#### **(6) Method of Academic Staff Assessment**

There is not any information at present on assessment of academic staff.

#### **(7) Process of Curriculum Design**

Curriculum is determined through deliberations within the Graduate School of Environmental Studies, and in consultations and discussions with other graduate schools. Other graduate schools are expected to continue this cooperative relationship.

## **(8) Facilities**

A variety of departments of the university cooperate within the Nagoya University Centre for Global Environmental Leaders to build a systematic curriculum for the development of environmental leaders and to provide the learning environment.

## **(9) External Funding**

The programme utilises funding from the Ministry of Education, Culture, Sports, Science and Technology to cover necessary expenses for programme implementation.

## **(10) Method of Programme Auditing**

There is not any information at present on programme auditing.

## **4. Relationships with External Organisations and Communities**

The Chubu Environmental Leaders Development Consortium (made up of local governments, governmental organs, chambers of commerce, technological centres, private companies, etc. from the Chubu region) was established to strengthen cooperative relationships with industry, educational institutions and government in the Chubu region. Agreements related to cooperation have been achieved, and plans exist for guest lecture visits for the “Systems of Environmental Industry” course, common to all specialty areas. Likewise, cooperation is planned with participating companies and local governments in the area of internships and training. Cooperative relationships with AC21 member universities and international organisations are being considered for overseas internships.<sup>1</sup>

## **5. Conditions for Admissions**

### **(1) Evaluation Standards for Selection of Applicants**

The programme is conducted as the education portion of the first half of doctoral courses in Environmental Engineering and Architecture of the Graduate School of Environmental Studies (47 student capacity) and Civil Engineering of the Graduate School of Engineering (34 student capacity). Students must enrol in one of these two specialisations. Consequently, each prospective participant in the programme must undergo the entrance examination for one of these specialisations and within the selection process express his or her desire to participate in the Global Environmental Leaders Programme. After applicants take the entrance examination (regular written and oral examination), programme participants are selected from successful applicants.

<Reference: Admissions Policy of the Graduate School of Environmental Studies>

Examinations are held to evaluate applicants’ areas of specialisation and basic English skills, along with applicants’ ability to apply specialised knowledge, expansive thinking ability, and desire to study.

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<sup>1</sup>The Academic Consortium 21 (AC21) is an international interdisciplinary consortium. It supports inter-university partnerships aimed at international student exchange and interdisciplinary exchange.

## **(2) Considerations for Mid-career Learners (of the Graduate School of Environmental Studies)**

Persons with two or more years of work experience following a previous degree, who are working at the time of application, and are not currently enrolled in an educational programme, have the option of undergoing a special admissions framework for mid-career learners (limited to a few persons).

## **(3) Standards for Selection of International Students**

International students from the Asian and African regions are targeted for the programme; however consideration is also given to a balance of students by region. At this point, the programme is considering utilising JICA long-term research programmes.

## **6. Student Futures**

### **(1) Paths after Graduation**

As the first class will enter in April of 2009, career paths after graduation are yet unknown. The programme is hopeful that graduates will find work in government organisations, local governments, international organisations, universities and businesses.

### **(2) Methods of Network Building between Graduates**

As the first class will enter in April of 2009, the building of networks for graduates will be carried out futuristically. The programme plans to maintain contact with graduates (students who complete the course).

## **7. Future Issues**

Response to internationalisation is a major issue related to the development of environmental talent. Concrete examples include the need for establishment of the educational system in English (English course materials, English-speaking academic staff, lack of course subjects in English, student support), adoption of a flexible admissions system (admissions examination, time of the year for admissions), and increased awareness among students (increased awareness among Japanese students who lack the confidence to undertake education in English).

In relation to the development of ideal talent, there is the need for clarification of the ideal image of the “environmental leader”, and the establishment of programme content which aims at this ideal image. There is also a need to determine the elements required for environmental talent and analyse international trends, and then to reflect this information onto the curriculum.

In relation to cooperation with external organisations, while the programme plans a cooperative system focused on the region and cooperation with international organisations, concrete plans for support have not been defined. Further deliberation is required. One issue is the need to build stable cooperative relationships with host institutions of internships (particularly for international student internships). The Chubu Environmental Leaders Development Consortium was started up, but its maintenance (establishment of an institutional system for continued cooperation) remains an issue.

Other issues include support for international students and selection of participants, as well as promotion of public relations and international exchange. Scholarships and support for housing is necessary for international students. Further, ensuring the enrolment of particularly competent students in the selection process is also an issue.

## **8. Other**

### **(1) Internships**

Internships are conducted with the aim of learning about a variety of problems and methods of coping through on-site training at internship locations. Through these experiences, students gain motivation to establish themselves as professionals. Students engage in over 90 hours of activity, including pre-internship preparation, main training and post-internship reporting. Students are evaluated comprehensively based on training reports and presentations.

### **(2) Scholarships**

A set number of international students are exempted from admissions fees and tuition during the period of study (two years). International students can apply for Japanese government (Ministry of Education, Culture, Sports, Science and Technology) scholarships falling into two categories, one for which selection is made before coming to Japan, and one for which application is made after coming to Japan. There are a limited number of scholarships for each type. The programme plans to provide financial support to all students for a part of the costs of overseas internships and investigative research.

### **(3) Language Study**

Student can take courses to improve English skills with the aim of improving class participation and research performance in English. International students are given information on language classes for learning Japanese for daily living.

## **9. Summary of Research**

The Global Environmental Leaders Programme is made possible by strong cooperative relationships among academic departments, characteristic of Nagoya University as a comprehensive university. The programme aims to develop human resources suitable to the global arena, both policy-makers and technical experts who will be active in the environment field. The curriculum is based on three main areas, climate change mitigation and adaptation, water and waste management, and biodiversity conservation. The curriculum aims to achieve the combined humanities and sciences model, inclusive of a wide range of fields. It is designed so that students can master the skills of a leader through seminars, debate and internships.

Several issues remain to be addressed. It is necessary to determine the elements required of environmental human resource and analyse international trends, and to reflect this information on the curriculum. Continuing cooperative relationships with external organisations need to be established. Further, educational systems related to English (English materials, lack of English course subjects, securing of staff, etc.) need to be addressed, and a support system must be established for international students. As the programme is to be maintained following the period of funding from the Ministry of Education, Culture, Sports, Science and Technology, it is essential that the programme build a solid system for future independent administration.

## Appendices

### 1. List of Interview Subjects

<b>Name</b>	<b>Position</b>
Masahiro Tawa	Professor, Nagoya University Global Environmental Leaders Programme

### 2. List of Reference Materials

Pamphlet of the Nagoya University Global Environmental Leaders Programme  
Application Materials of the Master's Programme of the Nagoya University Graduate School  
of Environmental Studies

### Other Materials Obtained

PPT materials on the formation of the Nagoya University Global Environmental Leader  
Development Base, the Nagoya University Global Environmental Leaders Programme  
Syllabus for the Nagoya University Graduate School of Environmental Studies  
“Internships (city)”  
“Field Seminar in Environmental Studies”  
Curriculum Proposal for the Nagoya University Global Environmental Leaders Programme  
PPT materials on the implementation system and content of the Nagoya University Global  
Environmental Leaders Programme

Websites:

Nagoya University Global Environmental Leaders Programme website

<http://www.envleaders.env.nagoya-u.ac.jp/index-e.html>

Nagoya University Graduate School of Environmental Studies website

<http://www.env.nagoya-u.ac.jp/en/>

## ■ Waseda University Graduate School of Environment and Energy Engineering

### 1. Outline of the Graduate School

#### (1) Background of Establishment

The Waseda University Graduate School of Environment and Energy Engineering is a new graduate school established in 2007. The new school is a further developed version of its predecessor, the Graduate School of Science and Engineering's Major in Environment and Energy Engineering (established in 2005). The school was set up as an independent graduate school located in Honjo City of Saitama Prefecture. The school aims to incorporate new developments in local revitalisation activities, specifically by providing cooperation in the local community toward solutions to community problems. Originally, Waseda University had plans to locate an undergraduate faculty in Honjo, however plans were changed year before last, and an affiliated high school was built instead. Also, the Graduate School of Global Information and Telecommunication Studies (GITS) was opened in Honjo ten years ago, and subsequently this independent graduate school was established two years ago.

#### (2) Aims of the Graduate School

The graduate school offers education and research related to the fields of energy, resources and the environment based on an understanding of the fact that consumption of energy and resources in society have resulted in environmental problems. Further, the school accepts not only new university graduates, but also people from a variety of areas of society (people with experience in business and government, citizens interested in the field, etc.). In doing so, the school aims to conduct educational and research activities from a neutral standpoint, valuing the opinions of members of each group and facilitating mutual exchange of competing opinion towards elucidation of and solution to problems.

#### (3) Basic Tenants on Education and Research

The following concepts are central to education and research.

- **Integrated academic-field approach:** education and research that is integrated with methods and systems from various fields.
- **Collaboration of citizens from four sectors:** education and research based on collaboration among the four sectors of the public, government, industry, and academia, as well as other countries.
- **Utilisation of experiential activities according to the principles *real locations, real things and real life*:** advanced OJT education and research which meets the needs of the times to understand and analyse problems in the real world and create resolutions by experiment and demonstration.
- **Collaboration with society based on firmly maintained independence and autonomy of the university:** research and education which proves worthy of people's trust based on cooperation with society while maintaining the independence and autonomy of the university.
- **Development, proposal and application of technologies and measures for society:** education and research that broadly utilise academic achievements to develop, propose and implement technologies, measures and policies toward the materialisation of socioeconomic systems.



#### **(4) Numbers of Academic Staff and Students**

Academic staff:	10 (8 professors, 2 associate professors)
Students:	50 per year
International Students:	10 (including doctoral course students) (as of 2008)
Male-female ratio:	8 to 2
Age range:	20s

- International students are mainly from the Asian region, with many from China in particular. Students from India, Italy, Iran, Saudi Arabia and Vietnam have enrolled in the past.
- As far as percentages of privately-funded and publicly-funded international students, there are more privately-funded students.
- From 2009, tuition will be free for international students under 30 years of age enrolled in doctoral courses at Waseda University.

#### **2. Image of Ideal Talent (Environmental Leader Concept)**

The graduate school aims to develop persons of talent who can execute practical and strategic action based on the three principles of real life, real locations and real things. These persons should have a well-developed view of environment and energy-related problems, and be able to utilise scientific and engineering methods of analysis and synthesis within an integrated academic field approach.

The following is the ideal type of talent to be developed (as well as locations for activities).

- ① Leaders in the field of environment and energy research and development (technological development, research and development, scientific research)
- ② Managers of environmental responses in businesses (research and development, environmental business, environmental management, etc.)
- ③ Persons to work in the region on environment and energy related issues (non-profit organisations, civil movements, community business, environmental education, etc.)
- ④ Persons to work in environment and energy related governance at the national and local government levels (environmental governance, etc.)
- ⑤ Persons to be the driving forces behind world responses to the environment and energy (international organisations, etc.)

The following are the desired skills to be developed.

- Comprehensive abilities: T-shaped model
  - ◆ Horizontal axis: comprehensive ability—a discerning comprehensive command of expert knowledge and the ability to strategically construct solutions to problems.
  - ◆ Vertical axis: comprehensive personal traits—strong sense of morality, ideas as a citizen above and beyond one's profession.
- Knowledge and wisdom in an expert field: U-shaped model
  - ◆ An attitude geared towards problem elucidation and a good command of scientific methods
  - ◆ An attitude geared towards problem-solving and a good command of engineering methods
- Environmental literacy: environmental policy, environmental law, environmental management, environmental technology.
- Other: awareness of others and language ability for cooperative relationships internationally and with other organisations.

### 3. Educational Curriculum

#### (1) Outline of Educational Curriculum

Table 8: Outline of Educational Curriculum

Degree obtained	Master (engineering or science)	Doctor (engineering)
Conditions for completion	Acquisition of necessary credits	Successful evaluation of master's thesis based on research instruction.
Period of study	two years	three years
Number of credits	30 credits	none <sup>2</sup>

As a rule, required credits are acquired through at least 14 credits of lecture courses taken during the first year (including core courses), with at least 18 credits taken by the end of the course. Students must also acquire at least 12 credits in practicum courses.

The Master of Engineering and Master of Science degrees are conferred based on selected research topics, outlined in the following table.

Table 9: Research Topics of Master's Degrees

	Engineering field Degree: Master of Engineering	Science field Degree: Master of Science
Research Guidance	Environment and Energy Systems Environmentally-conscious Design Environment and New Energy Environmental Systems and Machines Assessment of Environmental Systems Environment and Electric Power Systems Environment and Mobility Environment and Power Systems	Environmental Policy Science Energy and Environmental Policy Environmentally-conscious Design Environment and New Energy Environment and Mobility

#### (2) Distinguishing Characteristics of Curriculum

A major characteristic of the curriculum of this graduate school is its practical education based on the three principles of “real life, real locations and real things”. Students begin practical exercises focused on the local community from their first year. Through lectures by key persons in the community and government representatives, the programme aims for students to learn about situations in the community, discuss problem points, and develop projects towards solutions. Further, students are independently involved in national government and business research projects, through which they gain practical research and educational experience (which is called on the job training, (OJT)). Students do not merely engage in research, but must also report on research to the national government and businesses. Many students choose master's thesis research topics directly related to such research, and they receive practical training at a variety of locations. Further, for practicum courses, students engage in work experience at businesses and organisations in the form of internships, which are recognised for credit acquisition.

<sup>2</sup> Students may audit the lecture courses of the Graduate School of Environment and Energy Engineering with the approval of the instructor in charge. This also applied to the lecture courses of other graduate schools.

Another characteristic of the curriculum is its integrated academic field approach. The curriculum is based on the combined humanities and sciences model from the viewpoint that environmental literacy and an understanding of a broad range of academic fields related to the humanities, sciences and engineering are two essential traits of the environmental leader. Environmental literacy is considered to act as a foundational quality of an environmental leader and is designed to be acquired in coursework including environmental policy, environmental law, environmental management and environmental technology practicum.<sup>3</sup>

<Examples of practical education geared to local issues>

Table 10: Schedule of “Environment and Energy Engineering Seminar B” (programme of tours, debates and presentations in which all first year master’s course students participate)

Topic	Instructor	Outline
Issues in the local government: discussing the future	Shinge Yoshida, Mayor of Honjo City	Students learn of current issues the local government faces and deliberate together with the mayor, city officials on solutions to local environmental issues and local revitalisation.
Natural environment and natural areas of Honjo City	Masahiro Jinza (Forestry instructor, environmental counsellor)	Students walk around the Mt. Okubo area and learn about the historical relationship between the people and the mountain, changes in vegetation, Japanese unique ways of relating to forests and the state of natural areas.
Changing water conditions in the Honjo area and projects to restore Motokoyama River	Daito (former city hall employee)	Conditions of water in the Honjo area have changed dramatically in the post-war era. Students learn of present conditions and causes, as well as the sequence of events and current status of restoration projects of the Motokoyama River.
City rejuvenating projects	Representative of Urban Renaissance Agency	Explanation and discussion are held on the large-scale refurbishing project in the area of land next to the university. Further, simulations are studied utilising 3D VR technology.
Current conditions of waste treatment and use of cogeneration of heat in Kodamagun City	Representatives of related departments of Honjo City	Students learn about the present conditions of the “Koyama River Clean Centre” a waste treatment facility of the Kodamagun Area Union of Municipalities, located in Kodamagun City.
Circular systems for sustainable agriculture	Shosaku Takefuji (local farmer)	Students make observations on circular systems of agriculture and harmonisation of agriculture and industry in Japan through practical experience in rice cultivation, including planting the rice paddies, weeding and harvesting.
Tours of agricultural groups engaged in “healthy farming”	<i>Mukashigaeri</i> “Return to Old Ways” Group, Kanto region	Students study about Honjo area farmers’ efforts in advanced farming techniques and local revitalisation.
Local culture and folklore	Waseda Environmental Citizens Network (non-profit)	Students participate in actual projects, such as participation in local festivals, revival of once-ceased festivals, local folklore on old ways of living and games, and projects to revitalise other rarities in the community.

<sup>3</sup> These courses are designed mainly for humanities students.

### (3) Course Topics

Table 11: List of Course Topics

Lecture Subjects				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
Year 1, Term 2	Compulsory	Environmental Planning	lecture	2
Year 1	Core courses (minimum of 4 credits required)	Construction of Environment and Energy Systems	lecture	2
		Design Engineering for Environment	lecture	2
		Environmental Energy Conversion Engineering	lecture	2
		Environmental Policy and Science	lecture	2
		Advanced New Energy Engineering	lecture	2
		Environment-conscious Systems and Machines	lecture	2
		Environmental Energy Policy	lecture	2
		Environment and Kinetics Process Engineering	lecture	2
		Environmental Assessment of Systems	lecture	2
		Environmental System Engineering of Electricity and Machines	lecture	2
Concentrated unit	Option	Frontiers of Energy	lecture	2
Year 1		Environmental Security Systems	lecture	2
Year 1		Environmental Science	lecture	2
Year 1		Environmental Administration Management	lecture	2
Year 1		Environmental Economics	lecture	4
Year 1		Environmental Measuring Systems	lecture	2
Year 1		Environmental Control System Engineering	lecture	4
Year 1		Environmental Policy A	lecture	2
Year 1		Environmental Policy B	lecture	2
Year 1		Environmental Protection Technologies and Policies	lecture	2
Year 1		Environmental Business	lecture	2
Year 1		Environmental Law I	lecture	2
Year 1		Environmental Law II	lecture	2
Year 1		Introduction to Clean Energy Technologies	lecture	2
Year 1		International Intellectual Property Rights Business Theory	lecture	2
Year 1		Resources Recycling Engineering	lecture	2
Year 1		Natural Environment	lecture	2
Year 1		Environmental Conservation in Hydrosphere	lecture	2
Year 1		Intellectual Property	lecture	1
Year 1		Technical Presentations	lecture	2
Year 1		Technical Reading and Writing	lecture	2

Practicum Subjects				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
N/A		Internship	practicum/internship evaluation and report	2

Seminar Courses (joint courses)				
Term	Compulsory / Optional	Subject	Class format/ Method of assessment	Number of credits
Year 1	Compulsory	Environment and Energy Engineering Seminar A (Refer to later section on adoption of practical education)	seminar	2
Year 1	Compulsory	Environment and Energy Engineering Seminar B	seminar	2
Year 2	Compulsory	Advanced Environment and Energy Engineering Seminar A	seminar	2
Year 2	Compulsory	Advanced Environment and Energy Engineering Seminar B	seminar	2

Seminar Courses (Research Guidance and Individual Seminars)				
Term	Compulsory/ Optional	Subject	Class format/ Method of assessment	Number of credits
Year 1	Compulsory	Seminar Subjects A of instructing academic staff	seminar	2
Year 1	Compulsory	Seminar Subjects B of instructing academic staff	seminar	2

#### **(4) Distinguishing Characteristics of Educational Methodology**

One distinguishing characteristic of educational methodology is class format aimed at augmentation of the presentation and debate skills of students. Preparation of reports, group presentations and discussion are amply included in each course subject aimed at strengthening interpersonal skills. For example, in the Environmental Planning course, required of all first year students in the master's course, students in groups of four select a topic based on course content on which they compile research and observations. A one-night, two-day final seminar is held for presentations and debate on these topics. Group topics cover a wide range of subjects as students freely select topics. Examples of topics for 2008 include car-sharing, eco-tours, environmental behaviours in the home, support for China's forest recovery, environmentally friendly uses of fixed benefits, and so on. Presentations were not limited to mere explanations of current conditions and case studies, but also included proposals for new projects and improved dissemination. Content was interesting due to the free thinking of students. Discussion time was provided after group presentations, and active discussion took place including all members of the academic staff of the graduate school, external instructors, and the first year master's students.

In the Environment and Energy Engineering Seminar A, students in groups determine an environment-related topic regarding which they prepare a 10-page report on problem-solving methods. This report is also compiled into a 15-minute PowerPoint presentation. During the question and answer session following the presentation, a group representative asks questions on the presentation followed by class discussion. This class is held three hours every week during the first term of the first year, thus students have many opportunities to present. Even students who are not accustomed to giving presentations acquire presentation skills through repeated experience.

## **(5) Method of Course Assessment**

As previously mentioned, students are given opportunities to engage in presentations and debate in each course, thus in most cases course assessment is conducted by reports and presentations. There are not many courses that conduct written examinations.

## **(6) Method of Academic Staff Assessment**

Assessment of academic staff is implemented according to Waseda University evaluation standards. Waseda University has been conducting surveys for student evaluation of classes since 2001, and these surveys have been conducted on-line since January of 2007. As of the first term of 2006, approximately 6900 courses have been targeted for evaluation. Those in charge of setting courses and responsible academic staff determine what terms to implement evaluations and decisions on release of results. As student evaluations of class are not mandatory, it is difficult to determine how many students actually perform the evaluations on-line. In the case of the “Environmental Planning” course, the on-line survey is printed and students are asked to write down their impressions of the class.

## **(7) Process of Curriculum Design**

The curriculum was designed by the professors of the Graduate School of Science and Engineering’s Major in Environment and Energy Engineering, the predecessor to the Graduate School of Environment and Energy Engineering. No new courses were developed in the establishment of the new independent graduate school. Rather, utilisation of the curriculum of the major was continued.

## **(8) Facilities**

There are several facilities on the Honjo campus, including a library (Honjo Annex), the Honjo Study Ridge research building, the Environmental Information Laboratories, the Art and Science Centre, the Waseda Research Park Communication Centre, and a research facility called the Honjo Waseda Incubation on Campus.

## **(9) External Funding**

In interviews for this research project, it was found that the total budget for 2005, the year the Graduate School of Science and Engineering’s Major in Environment and Energy Engineering was established was 650 million JPY (of which 530 million JPY was public funding), and 630 million JPY for 2006 (of which 510 million JPY was public funding). In 2007, the year the new graduate school was established, the estimated budget was 700 million JPY (of which 600 million was public funding).

## **(10) Method of Programme Auditing**

Programme auditing is not implemented. However, as all members of the academic staff engage in instruction for seminars and master’s theses, there is active exchange of opinion and critique between professors regarding content of instruction and educational methodologies. Thus, from the graduate school’s viewpoint, it is working towards capacity development of academic staff.

#### **4. Relationships with External Organisations and Communities**

The Graduate School of Environment and Energy Engineering aims to establish an educational system which bridges academic areas, and works in close cooperation with the Waseda University Environmental Research Institute located in the same complex. In particular, it also aims to build a system of research and education grounded in the local community, in cooperation with the Honjo Waseda Research Park Foundation, government, private companies, non-profit organisations, and so on. For example, the school works on a part of a global warming mitigation project of the Ministry of the Environment to develop elementary technology for hydrogen society systems. It also worked with NEDO (New Energy and Industrial Technology Development Organisation) on the development of an advanced community bus and advanced transportation system. In this manner, the school advances leading substantial research through cooperation with industry, academia and government, in which students actually get involved and engage in on-the-job training (OJT).

As the school was newly established in 2007, at present efforts to form cooperative relationships in the community are focused on raising awareness in the community on the graduate school and the content of its research, as well as increasing name recognition of the graduate school in the community. According to interviews conducted for this research project, offers for collaborative research rarely come from other parties in Honjo city, rather the graduate school itself must make propositions. As there are seconded prefectural and city government employees at the Honjo Waseda Research Park Foundation (administrated jointly by Saitama Prefecture, Honjo City and Waseda University), projects are created through discussion with these employees and continuous proposals are made.<sup>4</sup> Further, the graduate school cooperates on environmental issues and target setting in preparation of Honjo city government environmental white papers. Efforts are being made to introduce and familiarise the people in the community with the research of the graduate school toward cooperative relationships with the community. This year, the “Hydrogen Festival” was held to introduce efforts toward the construction of a hydrogen model society. Science workshops for children and citizen participation in car-sharing experiments were conducted. Penetration into the community is also attempted through production of DVDs made by students to record their research contents.

Cooperative relationships with industry are implemented via research requests from businesses.

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<sup>4</sup> Originally the city of Honjo approached Waseda University, and secured land for the university very cheaply.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

There are two types of examinations for selection of applicants, an examination based on recommendation and a general examination. A recommendation from a current academic instructor is required for the examination based on recommendation, and the conditions for application are expected graduation, fulfilment of requirements for departmental recommendation, a strong interest in the environment and energy fields, as well as motivation for research. The selection process is by interview only. For the general examination, applicants must be expected graduates or previous graduates, and the selection process consists of a written examination (foreign language and specialised subjects) and an interview. Specialised subjects for the written examination cover three topics: 1) thermal engineering, 2) electromagnetism/circuit theory, and 3) environmental and energy policy. Students select two questions out of six total to answer.

Regardless of the type of entrance examination, all applicants are required to submit a research proposal. Students present their proposals in PowerPoint during interviews, followed by question and answer sessions with academic staff. Academic staff determines acceptance or rejection based on comprehensive evaluation of the contents of the presentation and the enthusiasm of the applicant.

### **(2) Considerations for Mid-career Learners**

The graduate school conducts a special selection for mid-career learners. Qualifications for application and method of selection are as follows.

<Qualification for Application>

- Work experience qualification: applicants must have worked as full-time staff for at least two years post-graduation at the place of employment at the time of application, and must return to work at the same organisation after completion of the course.
- Academic experience qualification: applicants must be university graduates.

<Method of Selection>

Research ability is evaluated comprehensively by application materials and oral examination.

- ① Application materials
  - A) Report of achievements (outline of professional experience)
  - B) Statement of purpose and research proposal (statement of purpose and desired research topic, outline of research plans)
- ② Oral examination  
Applicants prepare a PowerPoint or overhead camera presentation based on the report of achievements, statement of purpose, research proposal and any other voluntarily submitted materials.

### **(3) Standards for Selection of International Students**

International students are required to have obtained a level two certificate on the Japanese Language Proficiency Test.



## **6. Student Futures**

### **(1) Paths after Graduation**

Because the graduate school is an engineering school, the main career path after graduation is employment at engineering companies. Further, many graduates find employment in the energy sector, including petroleum/energy industry, heavy industry, automobile industry, and the power industry. Many graduates in the social sciences find employments at comprehensive research institutes. However, there are not any cases of graduates finding employment in the environment sector in the strict sense of the term. Career paths of international students are undecided. However it is likely that many of them will find employment in Japan, study techniques and then return to their home countries.

### **(2) Methods of Network Building between Graduates**

The Waseda Mechanical Engineers is an existing network for graduates, in which the main participants are students in mechanical engineering.<sup>5</sup> Various meetings, support for student extracurricular activities, meetings for research presentation, lectures, symposiums, etc., are held to promote mutual exchange between university (department of mechanical engineering) and society (alumni and industry). A group journal and newsletter are issued. Further, panel discussions on employment are held for students, and students utilise the network in their job search activities.

Students graduating from the Environment and Energy Engineering graduate school participate in this existing network, however students in the humanities fields participate in the new graduate network for Waseda Honjo campus graduates. There are plans to futuristically build an integrated network toward exchange among both engineering and humanities students after graduation. There are also plans to build a network for Asian and African students in the future, and to integrate this network with existing networks.

## **7. Future Issues**

One issue regarding which academic staff currently is apprehensive is the distant location of the campus, and the inconvenience experienced by students. Buses are run twice daily between Waseda's Okubo campus in the Shinjuku Ward of Tokyo and the Honjo campus. These buses are used by many students of the graduate school, but many feel the trip from home to the Honjo campus via the Okubo campus is very difficult. There is a dormitory on the Honjo campus, and a number of serious students use the dormitory during the week and return to their homes on the weekends. Consequently, there remains a need for the university to provide an attractive mechanism to cope with this issue.

A second issue is that due to the integrated academic field approach, the possibility exists that humanities students (20 of 50 students in each year's student body come from humanities-related undergraduate departments) comprehend only a superficial amount of course content. It appears that humanities students do not have an in-depth of understanding of course content when it is explained in detail. Extra support for humanities students is in most cases dealt with through students learning from each other. As group research projects and presentations are widely utilised, a base for mutual learning between students is established. Further, students who have comprehension problems in class ask questions to responsible professors.

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<sup>5</sup> The Waseda Mechanical Engineers website (in Japanese) at <http://www.kiyukai.mech.waseda.ac.jp/> (last accessed 1 January 2009).

A third issue is related to a curricular response to internationalisation. At present, all courses are conducted in Japanese, but use of English for core courses is being discussed should numbers of international students increase in the future. Currently, preparations are being made to change the textbook of the compulsory Environmental Planning course to an English textbook. If all courses are to be conducted in English, necessary language skills would be required of Japanese students to understand courses. The programme hopes that Japanese students will work independently to improve language abilities in order to conduct presentations in English. Further, international students are expected to utilise the e-learning programmes of Waseda University's Centre for Japanese Language to study conversational Japanese.

The graduate school aims to establish a joint graduate school with Beijing University's Research Institute for Sustainable Development, and is currently coordinating systematic concerns and curriculum. Plans to conduct classes in English exist, however Beijing University is calling for Chinese language skills from Japanese students, and difficulty is faced in conducting classes in English in China.

## **8. Other**

### **(1) Dual Approach International Environmental Leader Development Programme**

The Graduate School of Environment and Energy Engineering will conduct the "Dual Approach International Environmental Leader Development Programme" for a period of five years from July of 2008 to March of 2013. This programme was selected for 2008 funding for the promotion of science and technology (strategic base for development of environmental leaders). The programme aims to develop environmental leaders to be active internationally, mainly in the Asian region, and devises to promote cooperative relationships for education and research with several overseas universities.

Concrete target numbers for environmental leader training are 25 master's course and 17 doctoral course students from Japan, and 25 master's course and 17 doctoral course students from overseas, for a total of 84 persons. Targets for joint research proposals total 34, with a total budget of 100 million JPY. Efforts toward independence of this programme are visualised as the following sequence of events: 1) industry recognises the effectiveness of Waseda University as a training institution, 2) concrete cases include a international alliance of universities working together with the international strategies of industry, 3) being regarded as a model for other graduate schools of Waseda University and other universities, and 4) additional target numbers of persons to be trained.

Overseas cooperating universities are Beijing University and Shanghai Jiao Tong University in China, the University of Hyderabad in India, Chiang Mai University in Thailand, Nanyang Technological University in Singapore and the Egypt-Japan University of Science and Technology (E-JUST) in Egypt. Overseas cooperating incorporated organisations include the Sanden Corporation, Furukawa Electric Co. Ltd., the Re-Tem Corporation, Canon Electronics Inc., Taiheiyo Cement Co., T.Rad Co. Ltd., Nissan Motor Co. Ltd., the National Institute of Advanced Industrial Science and Technology, Mayekawa Mfg. Co. Ltd. (China), Sanden Corporation (Singapore) and Fujikura Ltd. (Thailand).

## **(2) Internships**

Internships are treated as practicum courses worth two credits, with the period of training to exceed 60 hours (over 10 days). As a rule, students find internships themselves. Students gain work experience at businesses and groups, and are evaluated comprehensively by responsible academic staff based on reports from host institutions and student-prepared training reports and presentations.

- Selection of host businesses and groups: internships may be pursued at businesses and groups (including universities) who recruit for students with the university, or those that students arrange independently. However, decisions on businesses and groups are made upon discussion with instructors, depending on whether the work will be of help to student research.
- Research (practicum) content: the programme aims for students to develop a high level of ability through practical experience on how the content of research carried out in the laboratory is being utilised in the processes of on-site research and development.
- Procedures
  - ① Selection and determination of host organisation.
  - ② The “Procedures for Practicum Application” must be completed two weeks prior to the practicum.
  - ③ Internship
  - ④ Students request responsible staff of the host institution to prepare the “Internship Practicum Evaluation Form”.
  - ⑤ The “Procedures for Practicum Reporting” must be conducted within a month of completion.
  - ⑥ Grading assessment and course registration (course registration only if credits are to be awarded).
- Method of assessment
  - ① “Internship Practicum Evaluation Form” from the host institution
  - ② Student-prepared “Internship Practicum Report”

## **9. Summary of Research**

The Graduate School of Environment and Energy Engineering conducts practical education with an integrated academic field approach, based on the three principles of real life, real locations and real things. Curriculum is designed to emphasise community issues. The programme aims to develop persons of talent who have integrated expert knowledge and intelligence, and who can engage in practical and strategic activity towards problem-solving. Students learn of community issues, gain an awareness of problems, then engage in solutions to these problems, gaining a truly “glocal” (viewing local issues from a global perspective) education.

Classes place importance on improvement of the presentation and debating skills of students. While on the one hand these skills are important interpersonal skills required of the environmental leader, they are also areas in which Japanese people are comparatively weak. Therefore, thorough augmentation of skills in this area is extremely beneficial to students.

The first class of the school will graduate in March of 2009. Expectations are high that graduates will take leading roles in finding solutions to environmental problems in their respective fields.

## Appendices

### 1. List of Interview Subjects

<b>Name</b>	<b>Position</b>
Masafumi Katsuta	Professor, Waseda University Graduate School of Environment and Energy Engineering
Shoichi Kurosawa	Visiting Professor, Waseda University Graduate School of Environment and Energy Engineering

### 2. List of Reference Materials

- 2008 Entrance Requirements for the Waseda University Graduate School of Environment and Energy Engineering
- 2009 Waseda University Graduate School of Environment and Energy Engineering, General Entrance Examination Requirements for the Master's Course (April 2009 admission)
- 2009 Waseda University Graduate School of Environment and Energy Engineering, Mid-career Learners Special Selection Examination Requirements for Master's and Doctoral Courses (April 2009 admission)
- Pamphlet of the Waseda University Environmental Research Institute

#### **Other Materials Obtained**

- Presentation materials, Mid-term Report on the Dual Approach International Environmental Leader Development Programme
- Presentation materials, Graduate School Introduction "What does the new graduate school aim for?"
- Student Presentations (PPT materials) for the 2008 Waseda University Training Course for Environmental Planners, Environmental Planning Course
- Survey form for class evaluation by class participants

#### Websites:

- The website of the Waseda University Graduate School of Environment and Energy Engineering: <http://www.waseda.jp/weee/english/index.html>

## **II. University Research in United States of America**

### **The Higher Education System of the USA**

There are approximately 4,300 institutions of higher education in the USA, including both two-year colleges and four-year universities. Two-year colleges are divided into public community colleges and private junior colleges, and as of 2007, there were 1,685 schools (1,045 public and 640 private). Four-year universities are divided into comprehensive universities, liberal arts colleges and specialised colleges and number at 2,629 schools (643 public and 1,986 private) (National Center for Education Statistics). Of these, there are approximately 1,400 universities which offer postgraduate courses. The university attendance rate for 2005 was 53.2 percent (International Comparison of Educational Indicators 2009, Ministry of Education, Culture, Sports, Science and Technology).

Regarding perceptions of higher education in the USA, the university is the setting for broad study focused on general education, and serious specialised education is conducted at graduate schools (Tanaka, 2000). Graduate schools offer more practical education, and areas of specialisation are characteristically subdivided. The period of study is two or four years for university, one to three years for postgraduate master's level courses, and three to eight years for doctoral courses. Part-time courses for working students are available for master's courses. Most universities require submission of high school grades, SAT or ACT test scores, letters of recommendation, and short essays for admissions evaluation. International students who are not native English speakers are required to submit proof of English ability (TOEFL scores). For graduate school admission, grades from undergraduate study (e.g. a minimum G.P.A. of 3.0) are most heavily weighted, but in most cases undergraduate majors are not relevant. In some cases, GRE or GMAT test scores are required for admission to graduate schools.

In Section 7 of the National Environmental Education Act of 1990 there is a clause regulating "environmental internships and fellowships". The clause stipulates that the Office of Environmental Education located in the Environmental Protection Agency will take a central role in conducting internships and fellowships and that the following agencies shall host a certain number of university students for internships and fellowships: the Environmental Protection Agency, the Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, the Council on Environmental Quality, federal natural resource management agencies, the Department of Agriculture, and the National Science Foundation. The same Section 7 also stipulates that internships and fellowships provide opportunities to work with professional staff of federal agencies involved in environmental issues and thereby gain an understanding and appreciation of such issues and the skills and abilities appropriate to such professions.

Graduate school curriculum is generally composed of core subjects that make up the nucleus of the programme, elective subjects in specialty areas (specialisation/concentration), internships, research projects, and a final examination or master's thesis. Core subjects are in most cases compulsory, and are designed for acquisition of basic and broad knowledge in the area of study. Elective subjects in specialised fields are designed for acquisition of knowledge in respective fields of specialisation. There are usually multiple specialisations to choose from in each programme, and students select one (or more) from within the choices available, whereby they take related courses to advance their respective areas of expertise. Each course subject counts for two to three credits, and students undertake compulsory and elective subjects according to interests and plans based on discussion with professors and advisors. Internships and research projects are often included within course subjects. A degree is obtained by acquiring the required number of credits, and then taking a final examination or submitting a master's thesis.

Career paths are divided into many areas, including business, governmental organs, NGOs, and so on. Most employers demand work-ready skills, and businesses in particular attach great importance to internship experience. Students most often conduct job searches utilising the university career centre, job fairs and alumni networks.

## ■Yale University School of Forestry and Environmental Studies

### 1. Outline of Yale University School of Forestry and Environmental Studies

#### (1) Background of Establishment

The Yale University School of Forestry and Environmental Studies was established in 1972 based on the existing forestry school. Yale University has a history in forestry studies dating back to the 1800s, and graduates have had major influence on nature preservation efforts along the east coast of the United States. The predecessor to the School of Forestry and Environmental Studies, the Yale Forest School was established in 1900. Professors involved in the founding of the school are known as forerunners in forest conservation efforts in the USA. One of the founders, Gifford Pinchot, was the first Chief of the United States Forest Service under President Theodore Roosevelt. Since its establishment in 1972, the current school practices education aimed at societal benefit and long-term management of the ecosystem. James Gustave Speth has been the dean of the school since 2000, and has expanded target academic areas to include ecology, biodiversity, environmental management, environmental economics, forestry science, forestry, global change science and policy, environmental health, environmental engineering, environmental law, urban ecology, environmental planning, environmental values, and coastal environmental management.

Dean Speth is a graduate of Yale's Law School and is one of the founders of the Natural Resources Defense Council, a highly influential environmental group with 1.2 million members and a yearly budget over 7.5 billion JPY. He is also a founder of the World Resources Institute. After serving as the head of the Council on Environmental Quality, was the Administrator of the United Nations Development Programme from 1993 to 1999. He then took the position as Dean of the Yale School of Forestry and Environmental Studies in 2000. In 2002, Speth was awarded the Asahi Glass Foundation Blue Planet award based on his achievements in environmental activities both domestically and abroad, and is known as a world leader in scientific solutions to environmental problems.

#### (2) Aims of the School

- To produce new leaders and knowledge to contribute to long-term sustainable maintenance and protection of the biosphere for human development;
- To establishment a truly global school to respond to global scale environmental problems;
- To promote harmonisation of human activity and nature towards sustainable use of natural resources;
- To develop a sense of values and high awareness toward the environment to save society and the natural world;
- To develop the environment school as a sustainable school;
- To utilise sciences related to sustainability for environmental management and environmental improvement;
- To promote cooperation with stakeholders in society toward resolution of environmental problems;
- To develop the environment school originating in forestry to include diverse academic areas.

### **(3) Basic Tenants on Education and Research**

The school aims further the establishment of the combined humanities and sciences model “environmental studies” as an academic field. To do this, it aims for students to master complex knowledge on the mutual relationships between human society and the natural world, and to apply this practical knowledge to environmental management.

### **(4) Numbers of Academic Staff and Students (2008-2009)**

Academic staff: 55 full-time  
                  20 concurrent posts  
                  28 lecturers from external organisations  
Researchers:  37 at school  
                  21 researchers in affiliated institutions  
Administrative office staff: 52

Apart from academic staff, researchers and office staff are numerous. Full-time office staff members work in various areas, including positions responsible for students, alumni, career development, admissions, educational programmes, funding, scholarships and so on.

Master’s course students: approximately 220 total  
                                  (80 percent of whom have work experience)  
                                  (In the 2008 academic year, there were approximately 90 first-year students, and in 2009 there were approximately 130 first-year students.)

Doctoral course students: approximately 75  
                                  (Doctoral course students are exempted from tuition and paid stipends for living expenses. Additionally they are paid a salary from research projects.)

Graduates to date:  approximately 4000

### **(5) Expenses**

Yearly tuition is 28,400 USD, and other expenses (textbooks, health insurance, etc.) are approximately 16,000 USD, totalling 44,400 USD.



## **2. Image of Ideal Talent (Environmental Leader Concept)**

- Persons who possess both a vision and the global human nature to make substantial contributions to the construction of a sustainable society domestically and abroad.

## **3. Educational Curriculum**

### **(1) Outline of Educational Curriculum**

The master's degree is divided into four types within the two categories below.

#### **Research-oriented**

- Master of Environmental Science: to augment understanding in environmental science fields other than forestry and to master holistic knowledge related to environmental fields.
- Master of Forest Science: to pursue studies in fields related to forestry and to master holistic knowledge related to environmental fields.

#### **Professionally-oriented**

- Master of Environmental Management: to advance scientific understanding of ecosystems and societal systems and to develop talent to apply this understanding to policy and management systems.
- Master of Forestry: to train professionals in the field of forestry resource management.

In order to obtain a degree, students are required to pay four terms of tuition and acquire the necessary credits for graduation (48 credits). Further, two terms and 24 of these credits must be acquired while enrolled at the Yale School of Forestry and Environmental Studies. The majority of students participate in the Master of Environmental Management course.

#### **Course for Mid-career learners**

A course is available which allows mid-career learners to obtain a Master of Environmental Management or Master of Forestry in one year. Participants must have over seven years of work experience and a certain standard of achievements.

### **(2) Course Subjects**

Programme content is as follows. Each student is assigned an academic advisor, and students take courses based on consultation with advisors.

#### **① Master of Environmental Science**

#### **② Master of Forest Science**

- There are no prerequisite courses, but it is necessary for students to have a basic knowledge of natural sciences and to have studied analysis methodology (measurement, hypothesis setting, hypothesis testing, etc.) prior to admission.
- Students gain a firm footing in theory, research planning, and methodology and engage in establishment of research activities towards continuation into a doctoral course.

### ③ Master of Environmental Management

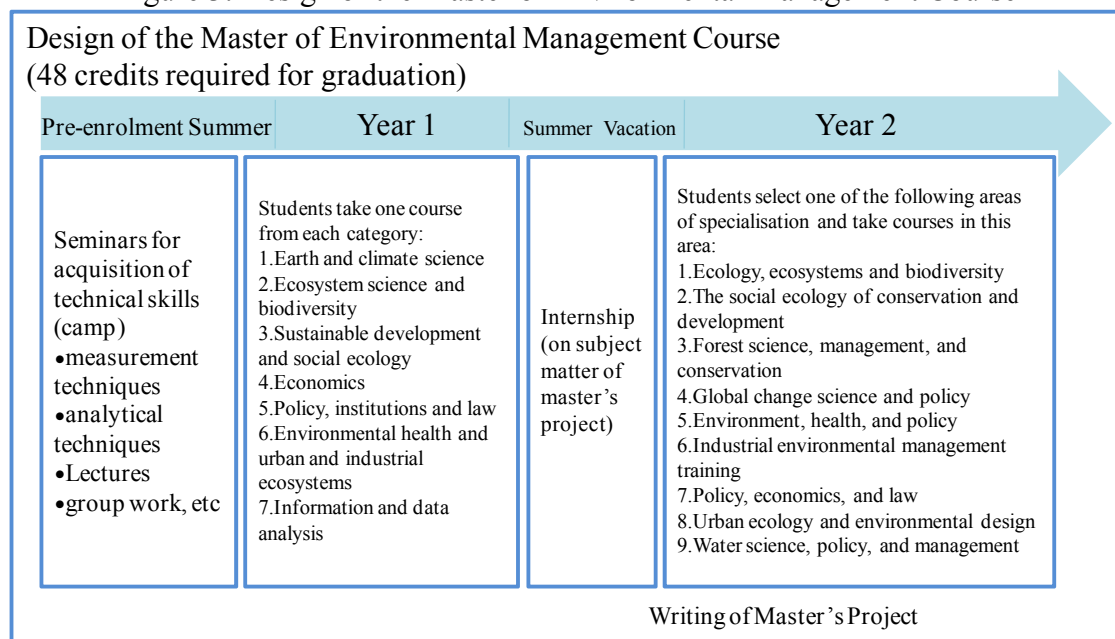
- Students take courses from seven different areas (for holistic knowledge related to the environment). A sample of courses is included in the list below.
  - Earth and Climate Science
    - Air Pollution
    - Biogeochemistry and Pollution
    - Environmental Hydrology
    - Biological Perspective of Global Change
    - Water Resource Management
  - Ecosystem Science and Biodiversity
    - Tropical Ecosystem Dynamics and Anthropogenic Change
    - Coastal Ecosystems
    - Landscape Ecology
  - Sustainable Development and Social Ecology
    - Topics in Environmental Justice
    - Technology, Society, and the Environment
    - Social Science of Development and Conservation
  - Economics
    - Economics of Pollution
    - Economics of Natural Resource Management
    - Economics of Sustainable Development
  - Policy, Institutions and Law
    - Science and Politics of Environmental Regulation
    - Foundations of Environmental Policy and Politics
    - Corporate Accountability
  - Environmental Health and Urban and Industrial Ecosystems
    - Organic Pollutants in the Environment
    - Corporate Environmental Management and Strategy
    - Transportation and Urban Land Use Planning
  - Information and Data Analysis
    - Remote Sensing: Observing the Earth from Space
    - Econometrics
    - Spatial Statistics
- Students select one of the following areas in which to take multiple courses (for learning of specialised knowledge).
  - Ecology, ecosystems and biodiversity
  - The social ecology of conservation and development
  - Forest science, management, and conservation
  - Global change science and policy
  - Environment, health, and policy
  - Industrial environmental management training
  - Policy, economics, and law
  - Urban ecology and environmental design
  - Water science, policy, and management
- Students are required to prepare and submit a master's project (proposal for solution to an actual problem).

#### ④ Master of Forestry

- The educational programme is divided into three stages.
  - Acquisition of basic knowledge for gaining understanding of comprehensive elements of natural and social sciences, applications of knowledge, and understanding of values.
  - Mastering of techniques for integrating knowledge: training to augment qualitative and quantitative analytical skills.
  - Polishing of knowledge and analytical skills: proposals or theses finalised utilising actual problems and data according to student interests.
- Students are also required to take courses on environmental ethics and undergo workshops in leadership and management abilities. Students select a course of specialisation according to interests.
  - Community development and social forestry
  - Protected areas management
  - Extension and education
  - Consulting and business
  - Watershed health and restoration
  - Tropical forest management
  - Forest industry and finance

### (3) Distinguishing Characteristics of Educational Curriculum

Figure 3: Design of the Master of Environmental Management Course



- Educational approach to establish a combined humanities and sciences model including an international view for the academic area of “environmental studies”.
- Acquisition of skills to analyse environmental problems from multiple perspectives regarding the mutual relationship between society and nature.
- Practical application of knowledge toward environmental management.
- Practical experience included in curriculum through technical exercises, internships and master's projects.

#### **(4) Distinguishing Characteristics of Educational Methodology**

Prior to September admission, students are required to participate in a three-week camp combining orientation and modules in technical skills. The modules utilise forests owned by Yale University for practical learning and include lectures, acquisition of measuring techniques, data analysis and group work. The camp also aims to promote exchange among students.

Methods are devised within regular lectures to encourage not only the acquisition of knowledge, but also the development of problem-solving ability and critical thinking skills. For example, some courses conduct a “Clinic”, in which analysis of facts, information collection and proposal preparation are conducted in response to actual requests from NGOs and businesses. Most of these activities are carried out as group work. Additionally, class participants are divided into several groups to visit various sites, on which analysis is conducted and reports prepared according to topics. Locations for field work are various, ranging from local municipalities to Hawaii. Travel expenses are provided from funding secured by the university. Faculty members in charge of courses are responsible for securing this funding.

The Yale University School of Forestry and Environmental Studies enjoys a good geographical location (less than two hours from New York by train or car), thus classes can be held on trips to the United Nations Headquarters.

Lectures are divided into foundational and specialised courses. Foundational courses are designed for students to master necessary theory and analytical methods related to each subject. Training is also conducted so that students can create their own long-term visions on individual environmental problems via development of analytical ability based on a certain level of authority and reality.

Most lectures assign students readings prior to class, whereby actual class is for discussion based on set topics. The attitude that students and teachers engage in joint learning through educational activities is prevalent in the USA, and students are called upon to actively participate in class discussions.

In specialised lectures focused on research activities, the final objective is the writing and publication of a short thesis. These papers are published in university journals, or as reports and white papers. Reports are summaries of conferences, and white papers are summaries of research results based on conferences and seminars. These publications are the important achievements of faculty and students.

Aside from regular lectures designed for acquisition of knowledge, other programmes are held, including leadership workshops, and seminars on acquisition of professional skills.

## **(5) Method of Course Assessment**

### **Example**

#### **Applied Forest Ecology**

Lecture content: forest environments, circulatory organisms, social economics and biological management, methods of nature restoration, methods of nature revitalisation.

Assessment: mid-term examination 20%, final examination 25%, short essay (15-20 pages) 40%, participation 15%.

Students must read materials in advance and participate in class discussion.

Instruction in essay writing is conducted as needed.

In some cases, lectures are held in forests and natural parks.

#### **International Environmental Law and Asia**

Assessment: seminar discussion 20%, seminar participation 20%, take-home test 60%.

Course content:

- Introduction: international law, the environment and Asia
- Transboundary pollution, responsibility and cooperation: international principles, Indonesian fires and SE Asian haze
- Asia and the environment: civilisation, colonialism and community
- CITES and the Biodiversity Convention
- Global forests and indigenous peoples
- Ozone precedents and the climate change treaty
- Stockholm and Rio: developing principles for North and South
- Compliance and international environmental institutions
- From principles to tools: human rights, EIAs and Dams
- National and regional approaches in Asia and ASEAN
- The future of climate change and Asia: equity and competitiveness, trade and energy
- Environment and governance in Asia: global, regional, national

Classes are conducted in seminar format and include lectures and discussion. At the beginning of each discussion, a student assigned to the topic makes a presentation from a critical perspective for the purpose of raising issues for debate.

#### **International Environmental Policy and Governance**

Assessment: participation 5%, response essays on empirical case study research 10%, international organisation agreement memo 15%\*, mid-term paper 25%, group work and presentations 5% each (10% total), final examination 35%.

Course Content:

##### **I. Analytical and theoretical tools**

This section aims at acquisition of foundational knowledge and concepts on the nature of governance, its objectives and aims, and solutions to environmental problems, as well as understanding the historical and present situations of governance.

##### **II. The problems: empirical case studies**

Concrete cases studies on three topics, climate change, forestry and fisheries, are utilised to augment understanding.

### III. Assessment and the future of global environmental governance

Discussion is conducted on civil society and trade regimes competing in global environmental governance and new approaches to global environmental governance. Deliberation and design are conducted on more useful forms of future governance.

Students are required to produce output in the form of reports and presentations on knowledge and concepts learned in class and independent study. Response essays and international organisation agreement memos are uploaded onto the discussion form of the class website, where students can freely view the works of others. They are also reflected onto class discussion, debates, and group work.

\*The international organisation agreement memo is a three to four-page memo analysing an international organisation or international environmental agreement (treaty) from three perspectives, summarising arguments on its 1) authority and 2) effectiveness, and outlining 3) potential lessons for better environmental governance.

#### **Environmental Politics**

Assessment: discussion papers (two papers, one to two pages each) 20%, policy process paper (three to four pages) 15%, policy brief (two papers, three to four pages each) 25%, final topic 30% (paper 20%, mock conference 10%), participation 10%.

Course content:

- Policy processes (issue-setting, institutions)
- American policy processes—new ruling government and issues
- American policy processes—auditing and law-making of congressional government
- EU and new environmental law documents
- Business and determination of environmental policy—USA vs. EU
- ANWR and discussion on climate issues
- NGOs and popularisation of environmental activism, patterns of political action
- Civil movements and environment: Russia, Mexico, Spain, USA and Brazil
- China's environmental policy
- Domestic institutions, energy policy—biofuels: Brazil vs. USA
- America's Energy Security and Resource Curse
- Industrialised countries (institutions): policies on toxic waste
- Environmental policy of transition periods—unofficial institutions and EU integration
- National environmental values and establishment of nation states
- Environmental politics of developing countries—South Africa
- REDD, forests and climate change
- Environmental policy-making in warring societies
- Microfinance
- MP symposium
- Climate simulation, country presentations

### **Resource and Environmental Economics**

Assessment: quizzes 10%, problem sets 25%, mid-term examination 20%, spreadsheet group project 15%, final examination 30%.

Course Content:

- I. Introduction
  - A. Overview
  - B. Microeconomics and analytical techniques
  - C. Modelling theory
- II. Environmental microeconomics
  - A. Market failures: externality, public benefit, market loss
  - B. Property rights and Coase
  - C. Pollution regulation policy methods and competitive ability
  - D. Environmental assessment
  - E. Asymmetry of information, green products, certification
- III. Resource economics
  - A. Fees for resource use, land, water
  - B. Renewable resources, open access, common resources
  - C. Non-renewable resources
  - D. Biodiversity
- IV. Environmental macroeconomics
  - A. Kuznets environment
  - B. Trade and environment
  - C. Sustainable development
- V. Climate change

### **Applied Data Analysis**

Assessment: Individual assignments 15%, group assignments 15%, experiment topics 5%, in-class quizzes 10%, mid-term and final examinations 30%, group project (evaluation of final report and poster presentation) 25%.

Course content:

- Foundations of statistical deduction
  - A) Calculations—standard error, margin of reliability, bootstrapping
  - B) Hypothesis verification—t-test and non-parametric alternatives
  - C) Data hypothesis and graphs
- Statistical modelling
  - A) Linear models—ANOVAs, multiple comparisons, methods of linear combination, simple linear regression, multiple linear regression
  - B) Methods of illustrating surplus
  - C) Common linear models
- Use of standard statistical software

### **Integrated Oral Communication for International Students**

Assessment: mid-term and final examinations 40%, assignments, class participation, attendance 20%, oral discussion skills 20%, listening/speaking 20%.

Course content:

- Discussion skills
- Listening skills
- Speaking (pronunciation, accent, rhythm, intonation)
- Critical evaluation skills

## **Economics of Sustainable Development**

Assessment: ① If mid-term examination score is higher than final examination score...problem sets 30%, mid-term examination 30%, final examination 40%,

② If final examination score is higher than mid-term examination score...problem sets 30%, mid-term examination 15%, final examination 55%.

Course content:

I. Goals and approaches: selection of policy for sustainable development

- Overview
  - Economic models for selection of policy for sustainable development
  - Policy debate on “development” according to our models, and what is sustainability?
  - Policy debate on environmental politics, population, and economic growth
- II. Tools: economic concepts involved in selection of policy for sustainable development
- Individual choice and foundations of the market
  - Thought on economic growth
  - Lack of resources and sustainability
  - Innovation and general equilibrium
  - Externality and internality—national concepts and cooperation
  - Efficiency vs. optimality vs. sustainability
  - Uncertainty vs. irreversibility
  - Measurement: implementation of sustainable development, use of numerical indicators for best choice

## **Academic Writing I (for international students)**

Assessment: outline 20%, outline of problem-solution essay\* 10%, problem-solution essay 30%, response essay\*\* 30%, assignments 10%.

Course content:

- Academic wording: use of academically correct words and phrases
- Summary preparation
- Plagiarism
- Evaluation of summaries (reading evaluation)
- Use of punctuation
- Design of phrases
- Raising issues, processes and solutions
- Methods of quotation
- Outline preparation
- Evaluation of problem-solution essay (reading evaluation)
- Preparation of response essay
- Grammar review

\*For the problem-solution essay, students define their topics and write on methods of problem-solving related to these topics.

\*\*For the response essay, students are to think critically on information gathered from readings, and respond to this information by clearly stating their own ideas.



## **(6) Method of Academic Staff Assessment**

Students evaluate professors at the end of the term after grades have been determined. Evaluation forms are distributed, and students fill in necessary items and submit forms to the academic department.

## **(7) Funding**

Funding for the Yale University School of Forestry and Environmental Studies is mainly made up of research funds from donations, tuition, use of assets and funding from external organisations. Yale is a comprehensive university with over 20,000 undergraduate students, but graduate school administration is independent of undergraduate schools. Funding is utilised for the salaries of professors and staff, scholarships, maintenance of facilities, and support for doctoral students.

## **4. Relationships with External Organisations and Communities**

The Yale University School of Forestry and Environmental Studies has official cooperative agreements with the following organisations, and conducts data-sharing and student change.

- Hubbard Brook Ecosystem Study in New Hampshire: a research institute that conducts complex research on air, land and ocean ecological systems.
- National University of Singapore: a research institution conducting a master's programme in environmental management for persons with work-experience.
- New York Botanical Garden: an institution with a botanical garden and related library, which conducts research activities.
- The Energy and Resources Institute: a research institution located in India that conducts research related to energy, resources, and sustainability.

The school also has agreements with the University of Vermont and Pace University which allow students to take lectures, obtain credits and degrees; however, dual degree acquisition is limited to programmes within Yale University.

The present Dean of the Yale University School of Forestry and Environmental Studies was previously the Administrator of the United Nations Development Programme. This fact, combined with aforementioned geographical advantages, has led to a close relationship with the United Nations in New York.

The Yale University School of Forestry and Environmental Studies is affiliated with the following ten specialised centres and projects. Professors, researchers and students work together on a variety of activities at these centres, including research activities, release of research results externally, administration of symposiums, preparation of proposals for external groups, and so on.

- Center for Biodiversity Conservation and Science
- Center for Business and the Environment at Yale
- Center for Coastal and Watershed Systems
- Yale Center for Environmental Law and Policy
- Center for Green Chemistry and Green Engineering at Yale
- Yale Center for Industrial Ecology
- Global Institute of Sustainable Forestry
- Hixon Center for Urban Ecology
- Tropical Resources Institute
- Yale Project on Climate Change

Aside from these projects, a variety of seminars and lectures are held at the university utilising the networks of professors and alumni. Social gatherings are often included in these seminars and lectures, giving students many opportunities to directly interact with highly renowned persons.

### **Example of Activity**

- Environmental Leadership and Training Initiative (ELTI) Programme

This project began in 2007 when the Tropical Resources Institute and the Center for Tropical Forest Science of the Smithsonian Tropical Research Institute received a donation of 4.8 million USD (approximately 480 million JPY) from the Lisbet Rausing Charitable Fund. The programme conducts training for business persons, managers, and policy-makers working in the fields of nature preservation and energy in Latin American and Southeast Asia. Concrete activities include workshops and conferences, short-term training courses, and issuing of related publications (conference reports, papers, white papers). Topics for these activities include: the effects of biofuel use on forests, forest industry, reduced emissions for deforestation and degradation (REDD), restoration and recovery of forests, and forests and water resources. Training courses have been held in Peru, Panama, Brazil, and Singapore. Researchers who have recently completed doctoral courses (about two persons) are hired as coordinators of these activities. Coordinators are responsible for administration of conferences and preparation of publications.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

The following documents are required for admissions.

- application form
- resume/curriculum vitae
- personal statement discussing career plans and reasons for applying
- transcripts of grades
- three letters of recommendation (of these, one should be from a university-related person)
- Score reports for the Graduate Record Examination (GRE) or Graduate Management Admission Test (GMAT), standardised tests for graduate school admission in the USA.
- application fee (70 USD for on-line applications, 90 USD for paper applications)
- TOEFL score report (for non-native English speakers)

The admissions selection process attaches great importance to awards for academic achievement, extra-curricular activities, work experience and other forms of leadership experience. Further, 80 percent of students gain work experience in related fields prior to admission. For the approximate 100 spots available, there are about 600 applications.

## **(2) Standards for Selection of International Students**

While English scores on the GRE are not weighted that heavily, scores on the TOEFL and other tests of English language ability are important. Conditions of admission are a score of about 600 on the TOEFL written examination, or a score of 250 on the computer version of the test.

One Japanese student enrolled in the course in 2008, and two Japanese students in 2009. There was an apparent trend to avoid admission of Japanese students, who despite high scores on English language tests, were perceived to not participate well in class and make only minor contributions to the school. On the other hand, staff persons in charge of admissions and students commented that the school would like to increase admission of Japanese students from now on.

## **(3) Recruitment Methods for International Students**

Depending on the region, in some cases school representatives visit other countries to conduct introductory talks on the school (in the past, the Middle East). In the past, announcement of admissions details were published in environment-related journals, but survey results showed there to be absolutely no applications based on information from these journals. Recent recruiting of international students focuses basically on providing substantial information on application procedures on the school's website.

Recruitment of Japanese students was previously carried out utilising alumni networks to conduct introductory talks in Japan; however, these have not been conducted of late. The majority of international student recruiting overseas takes place through alumni networks and personal introductions.

## **6. Student Futures**

### **(1) Paths after Graduation**

The career paths of master's course graduates are listed below. There is a recognisable difference in the rate of employment in various sectors each year. One point worth mention is, due to the strong relationship between the School of Forestry and Environmental Studies and the United Nations, nearly every year there are graduates who find employment in organs of the United Nations, such as the UNDP and World Bank.

#### ● 2006:

- businesses, consulting companies, law firms: 24%
- government organisations: 34%
- non-profit organizations: 24%
- education: 9%
- continuing education in doctoral courses 9%

#### ● 2007:

- businesses, consulting companies, law firms: 42% (breakdown: businesses 45%, consulting companies 45%, law firms 10%)
- government organisations: 15%
- non-profit organizations: 13%
- education: 9%
- continuing education in doctoral courses: 21%

The following activities are conducted to provide support for student employment.

- Professional development seminars
  - Interviewing skills
  - Negotiating salary
  - Continuing education in doctoral courses
  - Dress for interviews
  - Strategies for job and internship searches
  - How to get involved in job forums
  - How to write resumes and cover letters, etc.
- The resumes of current students are released (booklet and electronic formats) and distributed to businesses and alumni. They may also be viewed on the website.
- Utilisation of the Global eRecruiting Outreach Programme website. Organisations wishing to hire post job openings, and those looking for employment post resumes. There is a system for searching on both. No matching takes place, rather in the case of mutual interest, both parties move on to application processes.
- Recruiting on campus (employers visit the school to interview students).
- The Duke/Yale Joint Environmental Job Fair: every year a job fair is held in Washington, D.C., through joint cooperation with the Duke University Nicholas School of the Environment, which has a similar master's programme.
- Ivy League joint job fairs: a job fair held in New York and targeted at all majors and university students of the eight Ivy League schools (Harvard University, Yale University, Brown University, Columbia University, Cornell University, University of Pennsylvania, Dartmouth University and Princeton University).
- Other job fairs targeted at Yale University students (those aiming for employment in the non-profit sector, or business sector, etc.)

## **(2) Methods of Network Building between Graduates**

At present, there are 4000 graduates of the School of Forestry and Environmental Studies. The school makes lists of graduates in the USA and each foreign country and periodically sends out newsletters and e-mail news. This news includes information on the recent situations of alumni, job opportunities and introduction of the most recent activities at the School of Forestry and Environmental Studies. Alumni groups have been formed in the USA and in each region of the world that hold meetings periodically. In some cases, meetings are held to parallel the academic conferences of the American Forestry Association and the Ecological Society of America. There is a committee of alumni who conducts award presentation to alumni. The school employs full-time staff to perform work related to alumni networks. Alumni are an important source of donations, act as hosts for student internships, and provide a network for employment searches. Therefore, the employment of alumni itself is considered to act as public relations for the school. Nevertheless, as there is little chance of students becoming incredibly wealthy, donations from alumni are not very high compared to the business school, etc.

## **7. Other**

### **(1) Internships**

Credits for internships are compulsory. The objective of internships is to gain experience in a field of interest. A number of other advantages can be presumed, including work experience in another field, career development, network building, acquisition of social skills, and acquisition of problem-solving skills. Students are to utilise the summer break between the first and second years of the programme to pursue internships at businesses, NGOs, the United Nations, and so on. Students are basically required to find internships on their own, but if necessary the career office will provide support. Students utilise lists of potential host institutions for internships, as well as alumni networks. In some cases, internships are paid positions, but there are scholarships available for necessary travel and living expenses in the case of unpaid internships.

In the case of law schools in the USA, there is a general trend by which host institutions of internships become employers after graduation. However, internships of the School of Forestry and Environmental Studies are considered a part of the educational curriculum. Further, they are also considered to provide the opportunity for collection of data and materials for the previously mentioned master's project. Therefore, internships do not necessarily lead to employment.

### **(2) Scholarship Programmes**

Domestic students have a variety of opportunities to obtain scholarships, including federal student aid. About 85 percent of students apply for scholarships, and 75 percent obtain them. The financial situations of students are taken into account for scholarship provision. Students are ranked according to need, and the amount and order of assistance are determined based on these ranks. Yale University offers scholarships and loans to international students who are not eligible for domestic financial assistance. The Japanese student in the 2008 class is a recipient of a Rotary Foundation scholarship. Students accepted for admission must submit a financial statement, but financial situations are not considered at the stage of admissions evaluation.

Many students work part-time on the campus of Yale University. The School of Forestry and Environmental Studies has about 90 part-time job positions available to students. Hourly wages for clerical work range from 10 to 15 USD, whereas hourly wages for research assistants and teaching assistants range from 20 to 30 USD. Students work approximately 10 to 15 hours per week.

## **8. Future Issues**

- Balance of education between academic research activities and mastering of practical techniques, and balance of education between acquisition of specialised knowledge and holistic environmental knowledge.
- Continued acquisition of the most up-to-date information on environmental problems.

## 9. Summary

The Yale University School of Forestry and Environmental Studies was established in the early 1970s based on preexisting forestry studies. As a school of a highly renowned university with a long tradition in the USA, and as one of the oldest graduate schools in the study of the environment, the School of Forestry and Environmental Studies upholds a high quality of overall educational administration and makes continued efforts to maintain this level of quality. The school aims to develop persons of talent who are equipped with both the qualities of a global citizen and a vision, who can make substantial contributions to the construction of a sustainable society both domestically and overseas. The school offers two research-oriented master's courses and two professional-oriented master's courses. In order to establish the humanities and sciences area-spanning academic field of environmental studies, the school has approximately 100 academic faculty members equipped with expertise in a variety of academic fields, including ecology, economics, politics, urban engineering, chemistry, forestry, environmental health, law, social science, history and engineering. Staff members other than academic faculty also possess high levels of expertise.

The school is highly regarded as one of the top environmental schools internationally, and aims to produce talented persons who possess high-level capacities. From the year 2000, the school welcomed a former Administrator of the UNDP as its Dean, thereby improving upon its international character and funding capacity. The school makes the most of its geographical location, less than two hours by car from New York, to promote internships and lectures within the United Nations. Further, the school has several specialised research centres which conduct joint research among professors, researchers and students, other research activities, release of research results to external organisations, administration of symposiums and preparation of proposals for external groups. Additionally, the school has cooperative agreements with external research institutes, including the Hubbard Brook Ecosystem Study, the National University of Singapore, the New York Botanical Garden, and the Energy and Resources Institute. Joint research, mutual data-sharing and research activities are promoted with these institutions. Lectures of well-known persons are held often throughout the year, and educational and research activities aim to cooperate with a variety of organisations and social stakeholders.

The Yale University School of Forestry and Environmental Studies strives to practice education for development of work-ready professionals. Most of the 220 students enrolled in master's courses select the professional development course in environmental management. Approximately 80 percent of students have work experience, and leadership experience in some form is weighed heavily in the admissions selection process. Students live near the school in order to concentrate on their studies. Yearly tuition is 2.3 million JPY, and yearly expenses including living expenses total 4 million JPY. For this reason, 70 percent of students receive scholarships, and most students work about 10 hours per week on campus. Further, about 10 percent of students are enrolled in dual degree courses. Students are allowed to acquire credits and degrees through taking courses from other schools, but in general mutual acquisition of credits must be conducted within Yale University. An exception to the rule is dual degree acquisition for law school, which allows acquisition from two other law schools.

In the course aimed at professional development in environmental management, students first take lecture courses to gain foundational knowledge in holistic fields related to the environment. Subsequently, students take courses on specialisations and analytical skills to master techniques and the ability to apply knowledge to environmental problem-solving. Most lectures involve a number of tasks including testing, essay-writing, and final assignments, and readings prior to lectures are required. Lectures include discussion on topics led by the instructor, and students are called upon to participate actively, based on the idea that students and instructors engage in mutual learning. Many lectures also include group work and presentations. Students are not merely instructed by professors, rather actively engage in improvement of interpersonal skills. The course requires preparation of a thesis on actual problem-solving called the master's project. Students deal with actual matters and conduct information collection, analysis and proposals. Internships are required during summer breaks to pursue this master's project.

The career office located with the school is in charge of securing career paths for graduates. To this effect, it provides substantial career support by holding seminars on professional development and career forums. Graduates follow a variety of career paths, including business, government, non-profit and research. Graduates can pursue employment in their specialised fields. The career office cooperates with alumni relations staff to release and distribute information on the career paths of graduates yearly and the resumes of current students. Newsletters are sent to alumni, and alumni meetings are conducted across the country and in other regions of the world towards maintenance of the alumni network. This network is helpful in securing internships and employment for current students.

The school's research and educational activities, concentrated on the practice of high quality education, service to students and interaction with society are made possible by the large amount of funding available. Administrative costs of the university are covered mainly by student tuition, donations, research funds and use of assets. Donations are large due mainly to the tax system of the USA. Students are provided with high quality educational services, and thus have pride in the school, their educations and degrees. Thus, the activities of alumni in society themselves act as public relations for the school. In return for providing educational service and producing talent, the school enjoys kick-back benefits such as further development of educational and research activities through the activities of alumni in society and establishment of alumni networks. This arrangement is one reason that the business of university education in the United States is so highly developed.

## Appendices

### 1. List of Interview Subjects

Lisa Kleintjes Kamemoto    Director of Financial Aid  
Emly McDiarmid             Director of Admissions  
Robert Mendelsohn         Edwin Weyerhaeuser Davis Professor  
Stanton “Peter” C. Otis, Jr.   Director of Career Development

### 2. List of Reference Materials

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Websites:

School of Forestry & Environmental Studies, [www.yale.edu/environment](http://www.yale.edu/environment)



## ■Duke University Nicholas School of the Environment

### 1. Outline of the Nicholas School of the Environment

#### (1) Background of Establishment

There have for a long time been social scientists and natural scientists at Duke University with interest in global environmental problems. The precursors of the Nicholas School of the Environment were the Marine Laboratory established in 1930 and the School of Forestry established in 1938. The School of Forestry began to include environment-related learning with the establishment of the Master of Environmental Management programme in 1974. In 1991, environment-related programmes were combined to form the School of the Environment. In 1995, the school received a donation of 20 million USD (approximately 2 billion JPY) from Duke alumni and Boston industrialist Peter M. Nicholas, for education and research in environment-related fields. Thus, the school came to be called the Nicholas School of the Environment. In 1997, the Department of Geology joined the school as the Division of Earth and Ocean Sciences. In 2003, a donation of 70 million USD (approximately 7 billion JPY) was received from the Nicholas family, by which the Nicholas Institute for Environmental Policy Solutions was established and other activities of the school were enriched.

#### (2) Aims of the School

The objective of the Nicholas School of the Environment is to develop talented persons who have critical and creative thinking skills and action skills to build a sustainable society. The following two degrees can be obtained. The type of talent each degree aims to develop is as follows.

- Master of Environmental Management: to develop talent that can master analytical skills and problem-solving ability on environmental problems, and make possible both conservation of ecosystems and development of society. Contributions will be made to environment-related career development through acquisition of a balanced knowledge base in environmental science and environmental policy and quantitative analytical skills.
- Master of Forestry: to develop professionals for sustainable management of forest ecosystems. Objectives are to acquire knowledge of basic forest ecology and forest management.

#### (3) Basic Tenants on Education and Research

One distinguishing characteristic of the Nicholas School of the Environment is its education based on a combined humanities and sciences model. While recognising the importance of designing programmes to meet the respective career development needs of scientists, policy-makers and managers, the school bears in mind that balance is required in the development of talent towards construction of a sustainable society, regardless of career paths. For this reason, the school puts emphasis on field-spanning education and education to develop expertise.

#### **(4) Numbers of Academic Staff and Students**

Each year's class is comprised of approximately 100 students, with a total of 225 students currently enrolled in the school. In many cases, the ratio of male to female students in environmental studies graduate schools (similar schools such as those of Yale University, the University of Michigan, and the University of California, Santa Barbara) is 40 to 60 percent. This ratio in last year's class only was 50 to 50. International students make up just under 20 percent of the 100 students of each class, and there are three to four students from Japan. Other international students enrolled are from Brazil, Canada, Colombia, Cuba, India, Ireland, the Republic of Korea, Peru, China, and Indonesia. There are also international students sent from government organisations. Half of students enter the school directly from undergraduate programmes, and half are students with work experience. The average age of students is in the late 20s.

In 2008, there were 53 full-time academic staff members, and 52 with concurrent posts. The number of academic staff is large because instructors also engage in the research activities of the graduate school.

Student numbers in each class are for the most part 30 to 40 students per class, or in some cases 20 to 25 students per class.

Admission of doctoral course students is determined by funding secured by instructing academic staff members. At present, there are 115 doctoral course students enrolled. Most doctoral course students work as research assistants or teaching assistants.

At present, there are approximately 3,000 graduates of the school.

#### **(5) Expenses**

Yearly tuition is 28,300 USD, housing expenses are 6,500 USD, and other expenses (textbooks, health insurance, etc.) are 11,500 USD, totalling 46,300 USD.

### **2. Image of Ideal Talent (Environmental Leader Concept)**

The Duke University philosophy is based on the premise of development of talented persons to take on roles of responsibility in society. Education is carried out in daily university life with this in mind. The environmental leader and other leaders in society are thought to be synonymous. Foresight is seen as a necessary quality of a leader, but recognition of the relationship between problems and their surroundings is also important for the environmental leader. A sense of values toward the environment is also seen as a necessary trait of the environmental leader. Business models are used as reference for leadership development and cooperative relationships with external organisations.

### **3. Educational Curriculum**

#### **(1) Outline of Educational Curriculum**

The school is divided into the three areas of marine science and policy, natural sciences, and environmental science and policy, and these divisions are based on the precursors of the Nicholas School of the Environment. Plans exist to create the new divisions of environmental economics and policy, ecology and nature conservation, earth science and energy, and environmental health and toxicology.

Compulsory courses make up about one fourth of the curriculum. There are 48 credits required for graduation, with approximate details as follows. (Details differ according to the eight programmes mentioned later, the seven types of environmental management degrees and the master's programme in forestry.)

- About 30 credits: coursework (sciences, policy, economics, statistics, etc.)
- About 5 credits: master's project (Generally there is a master's thesis, but preparation of this problem-solving proposal based on practical experience is mandatory.)
- About 5 credits: short-term seminars and workshops, etc.
- Remaining credits: students may select options freely

#### **(2) Distinguishing Characteristics of Curriculum**

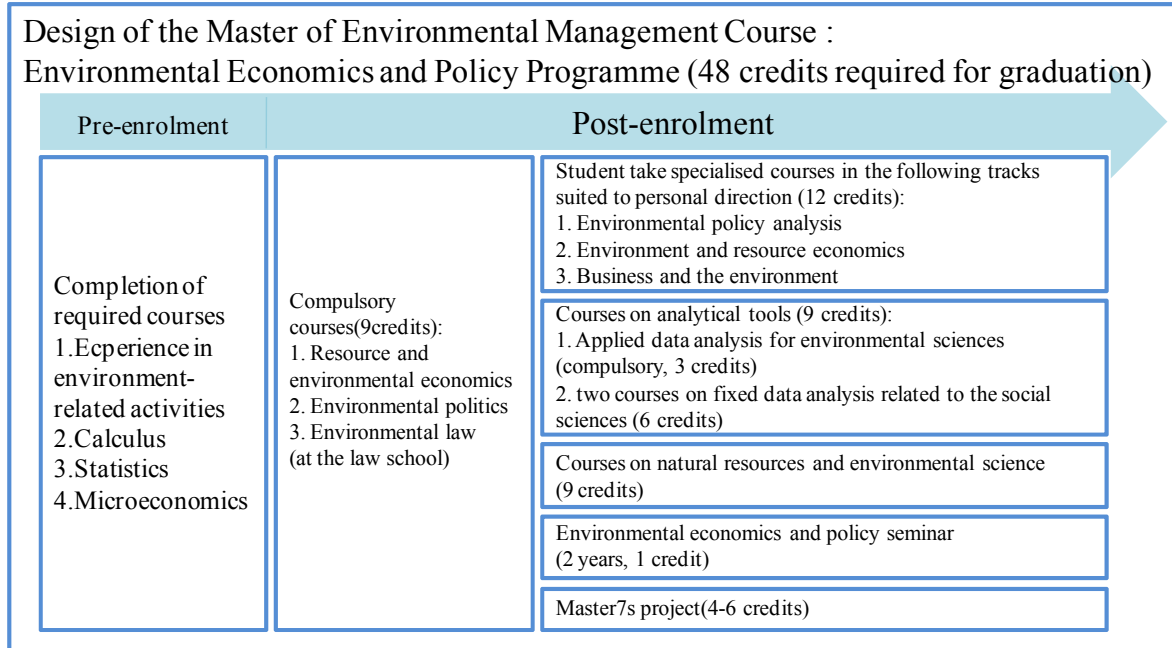
The Nicholas School of the Environment is made up of an undergraduate and graduate school, and awards environment-related degrees. The education of the school is said to span both the humanities and sciences, thus it is difficult for students to strengthen one type of expertise. Issues remain that students will become generalists. At the undergraduate level, students write reports on courses and design their own curricula for the purpose of augmenting expertise. Over half of undergraduates proceed on to graduate school (similar to the career development method of graduates of liberal arts colleges in the USA, who move on to graduate school to augment expertise).

In order to augment expertise, the Master of Environmental Management is divided into seven specialised programmes.

- Coastal Environmental Management
- Ecosystem Science and Conservation
- Environmental Economics and Policy
- Energy and the Environment
- Ecotoxicology and Environmental Health
- Water and Air Resources
- Global Environmental Change

The Master of Forestry is awarded for the Forest Resource Management Programme.

Figure 4: Design of the Master of Environmental Management Course



All of the programmes of the school have prerequisites (courses which must be taken prior to the course) according to the subject of the programme. Students must receive a grade of B or higher in these foundational courses (“previous training in the natural sciences or social sciences”, “one introductory course in calculus” and “a statistics course that includes an overview of statistics, probability, hypothesis testing, correlation, and simple linear regression”, etc.) and submit academic transcripts to the academic department. Prerequisites are not a requirement for admission, but should be completed within the first term of study after enrolment. Upon admissions decisions, students take these courses in the term prior to enrolment, in the summer, or through on-line courses. Mandating prerequisites maintains class quality, allows students to understand course content in detail, and makes credit acquisition possible.

### (3) Course Subjects

Prerequisites and courses for each programme are as follows.

#### ① Coastal Environmental Management Programme

##### Prerequisites

- experience in a natural science or social science field
- introductory course in calculus
- introductory course in statistics
- working knowledge of data analysis by computer
- introductory course in microeconomics

##### Compulsory courses

- Resource and Environmental Economics
- Marine Policy
- one selected policy course
- one selected ecology course
- one selected ocean science course
- one selected science and policy synthesis course

## ② Ecosystem Science and Conservation Programme

### Prerequisites

- computer familiarity, calculus, statistics
- principles of ecology
- microeconomics (not compulsory for ecosystem science and conservation but necessary for the Resource and Environmental Economics course)

### Compulsory courses

- Ecosystem Management or Conservation Biology
- two courses selected from Forest Ecosystems, Tropical Ecology, Wetlands Ecology, Soil Resources, or Biogeochemistry
- one course selected from Resource and Environmental Economics, Environmental Politics, or Environmental Law

## ③ Environmental Economics and Policy Programme

### Prerequisites

- previous training in the natural sciences or the social sciences related to the student's area of interest in natural resources
- introductory course in calculus (at least one course)
- one statistics course that includes descriptive statistics, probability distributions, hypothesis testing, correlation, linear regression, and simple ANOVAs
- microeconomics, or a introductory economics course that is predominantly microeconomics

### Compulsory courses

- Resource and Environmental Economics
- Environmental Politics
- Environmental Law

## ④ Energy and Environment Programme

### Prerequisites

- previous training in the natural sciences or the social sciences related to the student's area of interest in natural resources
- one semester of college calculus
- one college statistics course that includes descriptive statistics, probability distributions, hypothesis testing, confidence intervals, and linear regression
- introductory course in microeconomics

### Compulsory courses

- Energy and the Environment
- Energy Technology and Its Impact on the Environment
- Energy Economics and Policy
- Applied Data Analysis for Environmental Science
- Energy Modelling

## ⑤ Ecotoxicology and Environmental Health Programme

### Prerequisites

- one semester of college calculus
- one introductory applied statistics course covering descriptive statistics, probability distributions, hypothesis testing, confidence intervals, linear regression and simple ANOVAs
- one semester of college biology
- one semester of college chemistry
- one semester of college organic chemistry

### Compulsory courses

- Chemical Fate of Organic Compounds or Aquatic Chemistry
- Environmental Toxicology
- Human Health and Environmental Risk Assessment

## ⑥ Water and Air Resources Programme

### Prerequisites

- previous training in the natural sciences or the social sciences related to the student's area of interest in natural resources
- introductory course in calculus (at least one course)
- one statistics course that includes descriptive statistics, probability distributions, hypothesis testing, linear regression, and simple ANOVAs
- working knowledge of microcomputers for word processing and data analysis

### Compulsory courses

- one course selected from Watershed Hydrology, Environmental Fluid Mechanics, and Groundwater Hydrology
- one course selected from Biogeochemistry, Introduction to Hydrogeology, Soil Resources, and Chemical Fate of Organic Compounds
- one course selected from Environmental Toxicology, Marine Ecology and Biogeochemistry

## ⑦ Global Environmental Change Programme

### Prerequisites

- previous training in the natural sciences or the social sciences related to the student's area of interest in natural resources
- one semester of college calculus
- one statistics course that includes descriptive statistics, probability distributions, hypothesis testing, linear regression, and simple ANOVAs
- introductory courses in earth science, geology and biology are recommended

### Compulsory courses

- The Climate System
- Global Environmental Change

## ⑧ Forest Resource Management : Master of Forestry Programme

### Prerequisites

- one course in calculus
- one statistics course that includes descriptive statistics, probability distributions, hypothesis testing, linear regression, and simple ANOVAs
- working knowledge of word processing and spreadsheet analysis
- education in natural sciences, social sciences and humanities

### Compulsory courses

- Silviculture
- Forest Ecosystems
- Forest Resources Field Skills
- Forest Vegetation Sampling
- Ecosystem Management
- Forest Management Travelling Seminar
- Professional Ethics for Environmental Practitioners

## (4) Distinguishing Characteristics of Educational Methodology

Students are assigned preparatory work based on various reference materials. Discussions on these readings are conducted in class. Almost all courses conduct group work (two persons), presentations, and discussion. Students ask many questions, and in many cases professors throw these questions back at students to answer.

## (5) Method of Course Assessment

A typical method of assessment is to make a test or final project paper worth 30 percent the grade, participation worth 20 to 30 percent, and other items, including class assignments, quizzes and short essays, worth 30 percent of the grade.

### Example

#### Economic Analysis of Environmental Policies

Class size: approximately 30 students

Assessment: mid-term test 30%, final test 30%, problem sets 40%

Course content:

- utilisation of models
- utilisation of statistical software
- utilisation of data
- acquisition of economic theory, etc.

Students actually use statistical software on computers and learn methods of data analysis. Students bring in their own computers to all utilise software simultaneously.

## **Environmental Politics**

Class size: approximately 50 students

Assessment : discussion papers (2) 20%, policy process paper 15%, policy briefs (2) 25%, final assignment (paper 20%, simulation 10%), class participation 10%.

Course content:

- Formation and execution of environmental policy
- Country case studies on topics of environmental policy
- Multiple actors and mutual relationships in environmental policy
- Analysis of policy organisations and environmental policy choices
- International relations theory, public policy theory, policy process analysis

Class participants must read multiple professional journal papers, chapters of specialised monographs, and articles prior to class. Discussion in class is based on these readings. In the final class, students are divided into groups to conduct a mock Conference of the Parties to the Framework Convention on Climate Change.

### **(6) Method of Academic Staff Assessment**

Students evaluate instructors at the end of the term after grades have been determined. Evaluation forms are distributed, and students fill in necessary items and submit forms to the academic department.

### **(7) Process of Curriculum Design**

At one time, there were numerous courses offered at the university with content related to the environment. Pertinent courses were gathered from these offerings, and other subjects were added when lacking, to develop the current curriculum of the school.

### **(8) Facilities**

Students have access to the following facilities.

- computers for student use
- computer laboratory for geospatial data analysis
- large scale printer for printing of posters and maps
- Deep sea environmental chamber
- laboratories for environmental chemistry, plant ecology, landscape ecology, marine geology, hydrology, and oceanography
- videoconferencing facilities
- wireless Internet

Duke University's grounds cover 9,350 acres. The campus of this comprehensive university contains two undergraduate faculties, four graduate schools, and a general hospital. The university also owns 7,900 acres of forests, and 55 acres of gardens. For this reason, the university itself functions on the scale of a town.



The university has a many facilities (forestry research institute, marine research institute), and students of the Nicholas School can utilise these facilities according to specialisations. The following is an outline of facilities.

- Forest research centre: has collected 75 years of data and functions as a centre for field work.
- Duke University Marine Laboratory: located in Beaufort, North Carolina, approximately 300 kilometres from Duke's main campus. The laboratory owns two ships for research, and has established lodging accommodations and laboratories for marine related experiments. The National Ocean and Atmospheric Agency Center for Coastal Fisheries and Habitat Research, the University of North Carolina Institute of Marine Sciences, the North Carolina State University Center for Marine Sciences and Technology, and facilities of national marine parks are all located nearby, providing excellent conditions for field research.

Further, Duke University's Department of Biology is equipped with facilities for experiments on global warming, which students can utilise.

### **(9) External Funding**

In 2008, the school received roughly 670,000 USD in research funding from government and business. Yearly donations to the Nicholas School total 100,000 USD. Use of funds from donations is determined according to the wishes of the donating group. The Nicholas School employs two full-time staff for funding acquisition. (Duke University as a whole receives 2.5 million USD annually from businesses, foundations and individuals. The large quantity of donations is largely due to US government tax measures. The university as a whole employs 150 persons for funding acquisition. As tax exemption measures for donations are in place in the US, many businesses and individuals give donations. Companies such as Patagonia and The Gap donate one percent of all income to environment related NGOs. For this reason, there are many foundations established by businesses. Most universities receive donations and use them for facilities or programme enrichment, and in many cases the name of the donator is added to building and programme names. Duke University was named for James B. Duke, who gained his assets in tobacco production. In 1924, he donated 210,000 USD to Trinity College, an institution established in 1838 in the county of North Carolina.

### **4. Relationships with External Organisations and Communities**

The previously mentioned Nicholas Institute for Environmental Policy Solutions is located next to the Nicholas School of the Environment. It was established as a research institute to conduct various proposals related to environmental policy. It conducts policy research in cooperation with businesses and government organisations. Cooperative relationships with government organisations are made possible through the establishment of a Duke University office in Washington, D.C. The Institute releases research results to external organisations and publishes policy papers and policy briefs.

Mutual credit acquisition for courses is possible for all Duke University students with the University of North Carolina, Chapel Hill, North Carolina State University, and North Carolina Central University.

Students can take advantage of the comprehensive university to take classes outside the Nicholas School. In particular, many Nicholas School students take courses at the following schools of Duke University and other universities.

- Duke Law School's courses in international environmental law
- Duke Fuqua School of Business courses
- Duke University Marine Laboratory courses (possible field research in Singapore, Hawaii, and Trinidad)
- Duke's Terry Sanford Institute of Public Policy courses in public policy
- Courses in urban planning and environmental health at the University of North Carolina, Chapel Hill
- Courses in forest entomology at the North Carolina State University

Students from outside the Nicholas School also take Nicholas School courses. Dual specialisations and acquisition of dual degrees are also allowed. In order to obtain a dual degree, students must take a total of 72 credits, and spend an extra semester enrolled in school beyond the normal required period of enrolment (four semesters, of which three must be spent on campus). For example, the two-year business school course and the two-year Nicholas School course may be completed in three years for a dual degree.

Internship programmes are well-developed based on cooperative relationships with external organisations.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

The following documents are required for admissions applications.

- application form
- GRE scores
- essay outlining objectives of enrolment
- transcripts of grades
- letters of recommendation (one letter should be from a university-related referee)
- application fee

Transcripts and GRE scores are evaluated to maintain a certain level of standards at the university. Essays on objectives are weighted heavily. Essays must clearly state objectives for enrolment, career goals, and reasons for choosing the Nicholas School of the Environment.

### **(2) Considerations for Mid-career Learners**

More importance is attached to practical experience than grades.

### **(3) Standards of Selection of International Students**

The GRE scores of international students are not seen as important. Instead, scores on the TOEFL test are crucial. Students should obtain scores of roughly 600 or above.

#### **(4) Recruitment Methods for International Students**

No special methods are adopted. The percentage of international students in environmental schools in the USA is low. The high cost of tuition and lack of scholarship programmes for international students are reasons for this situation. However, reasons could lie in the fact that the programmes of universities themselves are not very international and therefore unattractive to international students.

### **6. Student Futures**

#### **(1) Paths after Graduation**

Of graduates of master's courses, 30 to 40 percent find employment in the non-profit sector, 30 percent in government (central and local), and the remainder in the private sector. Employment is secured by 97 percent of all graduates. Examples of employers include the Environmental Protection Agency, the U.S. Forest Service, and the International Mountain Bicycling Association.

#### **(2) Methods of Network Building between Graduates**

The career office releases the resumes of alumni and current student on its website and in booklet form, and conducts activities to gain the interest of employers. The office also holds workshops on writing effective resumes and cover letters and undergoing job interviews. Lists of internships and job openings are updated as needed. A joint career forum is held in cooperation with Yale University.

There are approximately 3,000 alumni of the Nicholas School of the Environment. Numerous seminars and lectures are held both on and off campus utilising the networks of professors, in which students can participate. Students also utilise these networks to determine hosts of internships. The Duke University name carries considerable weight within the United States. (<http://www.nicholas.duke.edu/career/>)

### **7. Other**

#### **(1) Internships**

The master's programme focus on developing leadership skills for use in society. As such, students are to engage in internships during the summer break between the first and second years. Usually wages are paid for internships. Wages are paid by the host institution, or alternatively by the university in the form of internship scholarships. In many cases, interns later find employment in host organisations, thus internships are considered an important part of career development. Types of internships vary, some based on contracts with the university and some arranged through the private networks of professors. Preparation of the master's project through participation in internships is a condition for graduation from the master's courses of the graduate school. Consequently, students are not required to prepare a so-called master's thesis. Students finalise a master's project, which is a proposal of a problem-solving model based on matters covered in their internships.

## **(2) Scholarship Programmes**

Roughly 80 percent of students receive scholarships. Yearly cost for Duke University including tuition and living expenses is totalling 46,300 USD. There are only limited scholarships available to international students, and acquisition of international scholarships is an issue faced by Duke University as a whole. Students must apply for federal student aid by February 1<sup>st</sup> of each year.

A variety of work is possible on campus including research assistance to professors, library work, and office work. Many students work about 10 hours per week, but any more work is discouraged as it is thought to affect studies.

## **(3) Language Study**

Students can take classes at other departments of Duke University and take full advantage of what the comprehensive university has to offer. Many students take language classes.

## **(4) The Duke Environmental Leadership Program (DEL)**

DEL is a distance learning programme targeted at working students. A Masters of Environmental Management can be acquired through the programme, which currently targets mainly at domestic students, but plans exist to expand programme targets to the global level. The DEL programme was founded on a donation from the Henry Luce Foundation.

At present, there are 24 students enrolled in the DEL programme, including a few foreign students. Students use Blackboard, an on-line distance learning system. Professors upload lectures as PowerPoint presentations and audio files, and students listen and study at their convenience. Weekly classes start at 8 p.m., during after-work hours, and focus on discussion. Students and professors connect on-line via the Internet. Based on this system, students can take classes regardless of location, and courses offer a high level of flexibility. Students gather at the university five times during the period of study, and face-to-face meetings are held among students and professors.

Five years of work experience and a letter of recommendation from an employer are necessary for application for admission. Most students take the course while pursuing their careers, and for this reason recommendations from employers are required. Many students are awarded promotions at work upon acquisition of the degree.

The DEL programme aims for students to acquire holistic knowledge related to the environment, and is considered to provide students with a “bird’s eye view”. While 48 credits are required for the on-campus programme, the DEL programme requires only 36 credits. Details of the course are as follows.

- Compulsory courses (12 credits)
  - ✧ Ecosystem Science and Management
  - ✧ Economics of Environmental Management
  - ✧ Environmental Law and Policy
  - ✧ Programme Management for Environmental Professionals
- Optional courses according to individual specialisation (12 credits)
- Environmental leadership module (1 credit):
  - The business school model is used for building leadership skills. A leadership consultant is in charge of the module. Conducted in Washington, D.C., this module offers lectures of renowned leaders followed by discussions.
- Master's Project (4 credits): preparation of a proposal directly related to the student’s work.

Evaluation of the programme by students is conducted by mid-term evaluation during the term and a final overall evaluation at the end of the term. A concrete example from a mid-term evaluation is the request for professors to include personal experience in lecture content. Based on overall evaluation, it was found that most students wanted to take courses related to energy and the environment. Thus, a new course was established. The programme has not responded to requests to lesson coursework to maintain quality in the course.

## **8. Summary**

Environmental graduate schools in the USA are highly developed in the area of nature conservation due to the country's history and traditions in nature preservation. The precursor of Duke University's Nicholas School was a school of forestry. As Duke University maintains a marine research institute in an area of the country well-equipped with marine related research facilities, the School of the Environment was founded in 1991 based on both the forestry and marine science schools. The School's master's course in environmental management was initiated by the forestry school in 1974.

A system for tax exemption for donations exists in the United States for enrichment of the countries educational activities, among other reasons. Duke University is no exception, and in 1995 received a 20 million USD donation for education and research on the environment from Duke alumni and Boston industrialist Peter M. Nicholas. Thus the school was named the Nicholas School for the Environment. In 1997, the Department of Geology joined the school as the Division of Earth and Ocean Sciences. In 2003, a donation of 70 million USD was received from the Nicholas family, by which the Nicholas Institute for Environmental Policy Solutions was established. The institute conducts policy research and policy proposal activities via active collaboration with external organisations. The school is divided into the three areas of 1) marine science and policy, 2) natural sciences, and 3) environmental science and policy, but plans exist to create the new divisions in response to societal needs. These are 1) environmental economics and policy, 2) ecology and nature conservation, 3) earth science and energy, and 4) environmental health and toxicology.

One distinguishing characteristic of the Nicholas School is its education based on a combined humanities and sciences model. While recognising the importance of designing programmes to meet the respective career development needs of scientists, policy-makers and managers, the school bears in mind that balance is required in the development of talent towards construction of a sustainable society, regardless of career paths. For this reason, the school puts emphasis both on field-spanning education and education to develop expertise. Master's courses for development of professionals include the Master of Environmental Management and the Master of Forestry. There are currently 225 students enrolled in master's courses. The ratio of international students does not reach 20 percent. About half of the students have work experience, and most of these students enrol in the programme after approximately three years of work experience. The average age of students is in the late 20s. Academic staff members total 105 persons, and engage both in education and research activities. Admission of the 115 doctoral course students in the school was basically determined by the funding of responsible professors. Doctoral students work as teaching assistants and research assistants.

Most of the master's course students are enrolled in the Master of Environmental Management course. This course is subdivided into seven areas of specialisation towards augmentation of student expertise in a specialised field. These areas are "coastal environmental management", "ecosystem science and conservation", "environmental economics and policy", "energy and the environment", "ecotoxicology and environmental health", "water and air resources" and "global environmental change". These seven programmes all have set prerequisite courses to maintain quality of course content. Assessment of student work is based on tests or essays, group work, and final assignments. Utilisation of actual data and practical exercises are included depending on course content. Based on the presumption of completion of prerequisite study, active discussions are conducted in class with the instructor acting as facilitator. Active participation in the classroom is fundamental to education in the United States even prior to university. Thus, instructors often pose discussions and questions to students. The United States has traditionally worked toward development of leaders. Including an ample amount of discussion, presentation and group work within courses is also aimed at the development of leaders.

Educational activities outside the classroom are well-developed at the Nicholas School, which owns an expansive forest and marine research institute. Further, students can select from an abundance of courses, and take advantage of the comprehensive university by taking courses in other fields. There is also the potential for mutual credit transfer between multiple area universities.

The Nicholas School of the Environment conducts a distance learning (e-learning on the Internet) programme for working students called the Duke Environmental Leadership Program. Students can acquire a master's degree in environmental management through this two-year programme, geared to provide mid-career learners with holistic environmental knowledge. This programme, focused on "leadership", not only gives students the opportunity to interact with a variety of environmental leaders, but also hires professional consultants to conduct workshops aimed at development of leadership skills.

Environmental career paths after graduation span many sectors, including government, consulting, private business and non-profit organisations. Particular mention should be given to the potential for employment at non-profit groups. This is also due in part to donations based on the US tax system. The active specialised projects of non-profit groups and acquisition of funding for hiring of experts is made possible for this reason.

The Nicholas School of the Environment maintains a well-developed educational system to provide high quality education by securing a large amount of funding. An extensive amount of work is assigned to students, through which they not only gain knowledge, but also build upon other skills and networks as they develop as experts. Further, substantial efforts are made to send students to suitable organisations in actual society and in the construction of networks. For this reason, the expertise not only of professors, but of admissions staff, career office staff and the staff of the school as a whole is high. Based on the above, the Nicholas School of the Environment maintains the development of high quality talent as a well-developed university education business.

## Appendices

### 1. List of Interview Subjects

Norman L. Christensen	Professor of Ecology
Deborah Rigling Gallagher	Assistant Professor of the Practice of Environmental Policy Executive Director, Duke Environmental Leadership Program
Jeffrey R. Vincent	Clarence F. Korstian Professor of Forest Economics and Management, Division of Environmental Sciences & Policy

### 2. List of Reference Materials

- Duke University, *DUKE AN OVERVIEW: Brochure*, 2004
- Duke University, Office of Undergraduate Admissions, *Duke Students Taking Their Knowledge To The World-Your Next Great Academic Adventure: Brochure*
- Duke University, Office of Undergraduate Admissions, *Tradition of Academic Freedom-Opening the Frontier: Brochure*
- Duke University, Office of Undergraduate Admissions, *The Duke Graduate-Your life after Duke: Brochure*
- Duke University, Office of Undergraduate Admissions, *Making a World of Difference-Students in the Duke Community: Brochure*
- Duke University, *The New Duke University Strategic Plan*
- Nicholas School of the Environment and Earth Sciences, Office of Enrollment Services, *Beyond the Nicholas experience-our graduates at work: Brochure*
- Nicholas School of the Environment and Earth Sciences, *Dukenvironment*, Fall 2008
- Nicholas School of the Environment and Earth Sciences, *Experts Guide 2007-2008*
- Nicholas School of the Environment and Earth Sciences, *Explore the environment at Duke: Brochure*
- Nicholas School of the Environment and Earth Sciences, *The Duke Environmental Leadership Program: Brochure*

#### Other Materials Obtained:

- Nicholas School of the Environment and Earth Sciences, overview of career services
- Nicholas School of the Environment and Earth Sciences, syllabus information

#### Websites:

- Nicholas School of the Environment and Earth Sciences, [www.env.duke.edu](http://www.env.duke.edu)

### **III. University Research in UK**

#### **The Higher Education System of the UK**

There are approximately 160 universities in the UK. British universities are divided into campus, non-campus and colleges (Guide to Study Abroad in the UK, 2009). Campus universities, the type common in relatively new universities, have all facilities gathered at one location, including academic faculties, lecture rooms, libraries, athletic and housing facilities, and so forth. Non-campus type universities are most often universities with relatively long histories, where school buildings have been scattered due to expansion of the university in faculty organisation, and so forth. Colleges are found in universities with long histories, such as Oxford, Cambridge and Durham, where large numbers of colleges converge to make up the university. Colleges have facilities for housing, libraries, cafeterias, and also offer systems for tutoring and extracurricular activities, functioning as “mini campuses”. The university attendance rate in 2006 was 59.2 percent (Ministry of Education, Culture, Sports, Science and Technology, 2009).

The higher education institution in the UK is seen of as a centre for academic research to master high-level expert knowledge, in a sense an institution for training of the elite. Enrolment of mid-career learners with the aim of career advancement is also common. The period of study is three years for undergraduate (bachelor’s degree), one year for postgraduate master’s courses, and three or more years for doctoral courses. There are part-time master’s courses set up for mid-career learners, which allow acquisition of the same degree as the full-time programme in two years. Depending on the university, there are in some cases two types of courses set up, one for a degree and one for a diploma. Students who prepare a master’s thesis in addition to master’s coursework are conferred a degree, and those who complete only the coursework are awarded a diploma.

Admissions screening for undergraduate and postgraduate courses involves a comprehensive evaluation of past grades, research proposals, letters of recommendation and stated reasons for application. Interviews are not generally conducted. International students who are not native English speakers are required to submit proof of English ability (Scores on IELTS or TOEFL tests). There are not many instances in which an academic background in a certain field is required for admission, rather in most cases past grades are regarded as particularly important. Likewise, work experience is rated highly in the selection process. Thus, it is often the case that over half of the students in postgraduate programmes are mid-career learners.

There are two types of master’s courses, including the taught course, a combination of lectures and master’s research, and the research course for master’s research only. The majority of students pursue taught courses. Curriculum is made up of compulsory subjects, optional subjects, and preparation of a master’s thesis. Students pursue previously determined compulsory subjects and optional subjects each semester. The master’s thesis is generally prepared during a three-month period following the nine month period of coursework.

The employment rate for graduates of UK postgraduate programmes is high at over 90 percent (HESA, 2008), while the unemployment rate for university graduates is showing a decreasing trend (HESA(b)). Undergraduate and graduate schools have firmly maintained their traditional status as institutions of higher education that value academic research and advancement of expertise in each field. For this reason, there is a shared trust in the quality of education, and a high estimation of students in society. The paths of graduates traverse many directions, including research institutes, government, business, NGOs, and so on.



**■Oxford University School of Geography and the Environment, Environmental Change and Management Programme**

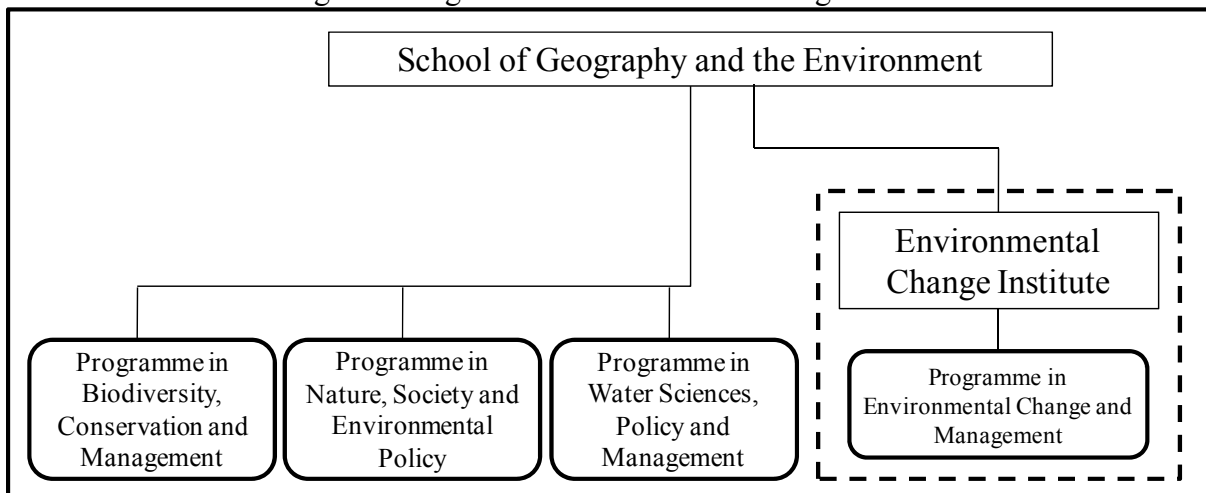
**1. Outline of the School of Geography and the Environment and the Environmental Change Institute**

**(1) Background of Establishment**

The predecessor to the School of Geography and the Environment (SoGE) was the School of Geography, founded over 100 years ago by Halford Mackinder. Efforts of the Royal Geographical Society and Oxford University led to its establishment. Following its founding, the school produced large numbers of superior researchers and experts, and its achievements have made contributions to the rapid advancement of research not only in the UK, but in the world. At the time of its founding, the School of Geography and the Environment, with a history of over fifty years, offered only a doctoral course as its environment-related programme. However, in 1991, SoGE and Oxford University together founded the Environmental Change Institute (ECI) within SoGE, a research department specialising in environment, thereby the establishment of master’s courses were considered.

Programmes were actually begun in 1994 following a three-year preparatory period. At this time, the MSc in Environmental Change and Management was the only course, but three new programmes were established in 2002, namely the MSc in Biodiversity, Conservation and Management, the MSc in Nature, Society and Environmental Policy, and the MSc in Water Science, Policy and Management. These three programmes are administered by the School of Geography and the Environment, while the programme in Environmental Change and Management is administered by the Environmental Change Institute, each conducting its own programme administration and curriculum design.

Figure 5: Organisation of School and Programmes



## **(2) Aims of School**

Through establishment of interdisciplinary master's level programmes to address environmental problems which span many fields, the school aims to develop policy makers for society. The following four master's degrees can be obtained.

- Master of Science in Biodiversity, Conservation and Management
- Master of Science in Environmental Change and Management
- Master of Science in Nature, Society and Environmental Policy
- Master of Science in Water Science, Policy and Management

The following are given as programme aims for the master's course in Environmental Change and Management (MSc Environmental Change & Management Course Information Pack 2007-08, p. 2).

- To develop and test student understanding of the basic principles involved in the wide range of subject material that can be involved in tackling the management of environmental change.
- To develop specialist knowledge in at least two fields
- To develop an understanding of alternative courses of action in the management of environmental problems
- To develop appreciations of the complex and multi-faceted nature of environmental problems, and to actualise countermeasures and solutions for them.
- To develop an ability to convey ideas and recommendations clearly and logically in both verbal and literary form.

## **(3) Basic Concepts of Education and Research**

Education based on a combined humanities and sciences model is one distinguishing feature of this school. The school attaches importance not to the development of professionals in the environmental field, but rather to high quality education based on a traditional view of the university. Thus, it aims to develop academically oriented persons through instruction in expert knowledge and concepts. The school does not conduct any particular systematic instruction in career development for students, rather deals with students individually according to respective aspirations. The school aims to ensure that upon completion of the master's course, students have acquired a base of knowledge, concepts and skills to continue on to their respective careers. The curriculum is designed to maintain a balance between expert knowledge and interpersonal skills. Generally speaking, the school aims to deepen understanding of the interdisciplinary nature of the environment field. This is not accomplished through specific instruction in the interdisciplinary nature itself, rather students are encouraged to learn of the interdisciplinary nature of environment themselves through classes and research in each programme.

## **(4) Academic Staff and Student Numbers**

Each programme is set up for 30 students, but flexibility is evident depending on the circumstances of student applications and selection each year (table.6). There are currently 135 students total enrolled in the school, with 39 students in the Environmental Change and Management programme.

Regarding the ratio of male and female students, every year approximately 70 to 80 percent of students in the Biodiversity, Conservation and Management programme are women, a markedly high rate of female students. There are also comparatively more women in the other three programmes, but numbers are closer to the half. Students with work experience make up approximately half of all students. Further, international students make up 70 percent of the total student body, with many students from EU countries and Africa, and very few from Asia. While enrolment in the Environmental Change and Management programme varies each year, the number of Japanese students ranges from zero to three. Student age ranges from 21 to 34, with average age in the late 20's. Approximately 20 percent of master's students go on to doctoral courses.

The total number of teaching staff for the school is 175 persons (see table 7 for a breakdown). The school contains several research institutions, such as ECI, the Tyndall Centre, and the UK Climate Impacts Programme. Researchers from these institutions are also involved in programme administration for the school through classes and student instruction.

Table 12: Trends in Division of Male and Female Students

**Biodiversity, Conservation and Management**

	Female	Male	Total	Female	Male
2005	18	7	25	72%	28%
2006	20	4	24	83%	17%
2007	21	7	28	75%	25%
2008	25	6	31	81%	19%

**Nature, Society and Environmental Policy**

	Female	Male	Total	Female	Male
2005	19	6	25	76%	24%
2006	18	9	27	67%	33%
2007	18	12	30	60%	40%
2008	20	16	36	56%	44%

**Water Sciences, Policy and Management**

	Female	Male	Total	Female	Male
2005	10	7	17	59%	41%
2006	8	8	16	50%	50%
2007	17	10	27	63%	37%
2008	15	14	29	52%	48%

**Environmental Change and Management**

	Female	Male	Total	Female	Male
2005	22	11	33	67%	33%
2006	21	14	35	60%	40%
2007	19	14	33	58%	42%
2008	22	17	39	56%	44%

Table 13: Staff Numbers for the School of Geography and the Environment  
(postgraduate only)

	Number of persons
Academic Staff	29
College Lecturers	9
Academic Associates	7
Research Staff	82
Research Associates	N/A
Support Staff	41
Visiting Professors	7
Total	175

## 2. Image of Ideal Talent (Environmental Leader Concept)

The school attaches importance to the following qualities regarding the ideal image of the environmental leader.

- Communication skill.
- Management ability, maximisation of social capacity
- Networking ability
- Critical thinking
- Expert knowledge base of knowledge and concepts related to environmental fields
- Interdisciplinary perspective on environmental problems

The school designs its curriculum aiming to cultivate these abilities in students. Students are given the opportunity to improve their interpersonal skills, including communication skills, management ability and networking ability, through instructional methods such as class discussion, group work and presentations. An expert knowledge base in environment and interdisciplinary perspective on environmental problems are taught through traditional lecture methods of instruction.

There is basically no difference between the qualities necessary for a leader and an environmental leader. However, the common understanding of the environmental leader in particular requires that he or she have both the qualities of a leader as well as an environmental mind, which prioritises consideration for the environment.

### **3. Educational Curriculum**

#### **(1) Outline of Educational Curriculum**

Currently, the school offers four master's programmes, 1) the MSc in Biodiversity, Conservation and Management, 2) the MSc in Environmental Change and Management, 3) the MSc in Nature, Society and Environmental Policy, and 4) the MSc in Water Science, Policy and Management. Each programme has differing compulsory subjects, but shares common optional subjects.

The curriculum of the Environmental Change and Management programme is made up of three compulsory subjects, two optional subjects, fieldwork and the master's thesis. Curriculum for compulsory subjects is designed to augment an expansive understanding of environment-related fields. For example, classes cover of an extremely wide area including physics, ocean currents, economics, environmental law, politics, and environmental ethics. Covered topics bring together a wide range of subjects, such as climate change, biodiversity, waste management issues, and so forth. Compared to compulsory subjects that cover a wide range of knowledge, optional subjects are selected according to student interests and specialities, to improve expertise in those fields. The axial area of study of this programme is "environmental studies", but because the current school was originally a school of geography, many of its professors are experts in geography. Thus the geography-related elements of the programme are relatively strong. For this reason, instruction in master's thesis research is provided in cooperation with other schools in the university.

The Environmental Change and Management programme also has a unique course called the Friday Workshop, where students freely select classes to attend according to interests and unrelated to required course credits. Workshops consist of special lectures conducted by academic staff of ECI, as well as guest speakers from other research faculties of the university and external organisations. The same programme also conducts an interdisciplinary module for all students during the first and second weeks of the programme. This module was established to encourage interdisciplinary thinking toward the environment prior to commencement of specialised area study. Each semester, a set topic is examined from many perspectives in lectures, group work, presentations, and so on. For example, in the first term of 2008, climate change was the overall topic, with classes offered in a variety of subjects, including, "International Conferences on Climate Change", "Vulnerability of Food Systems", "Adaptation to Climate Change in the UK", "Climate Governance and Indigenous Communities". Further, these classes are mainly conducted by guest speakers from external organisations, allowing students the opportunity to hear about actual field case studies, an extremely stimulating content for students (Week 1). In Week 2, students are divided into groups to prepare group presentations on assigned topics based on the knowledge and experience gained in Week 1. Presentations are conducted at the end of this week. Students are expected to learn about the interdisciplinary nature of the environment through their own experiences in these sessions. The school endeavours to reflect the interests of students as much as possible in topic selection for the interdisciplinary module.

After completion of all coursework, students prepare master's theses on chosen research topics. Fundamentally, research is carried out under the instruction of academic staff of the School of Geography and the Environment or ECI. However, flexibility is evident in some cases when due to student research topics instruction is entrusted to other faculties or external organisations. Further, if necessary for research, internships during the thesis preparation term are allowed. Arrangements for such internships are for the most part made by the student him or herself.

**(2) Distinguishing Characteristics of Educational Curriculum**

The master’s course in the UK is a short one-year course made up of an extremely intensive programme, where students concentrate on coursework during the semester, and after completion of all coursework begin preparation of master’s thesis. Based on the traditional view of the university, in which the graduate school is an academic institution for the provision of high-level education, importance is placed not upon the training of professionals to serve society, but on conducting education aimed at the improvement of the academic level of students. For this reason, it is often the case that students with work experience undertake master’s or doctoral courses with the aim of augmentation of expertise or mastering of concepts.

The programmes of this school are all full-time. The lack of a part-time system is due to the necessity for students to devote themselves to coursework and research for the short one-year period, during which they build up the expertise that becomes the base for their future careers. Accordingly, employment and internships during the semester are not recommended.

**(3) Course Subjects**

Figure 6: Design of Environmental Change and Management Course

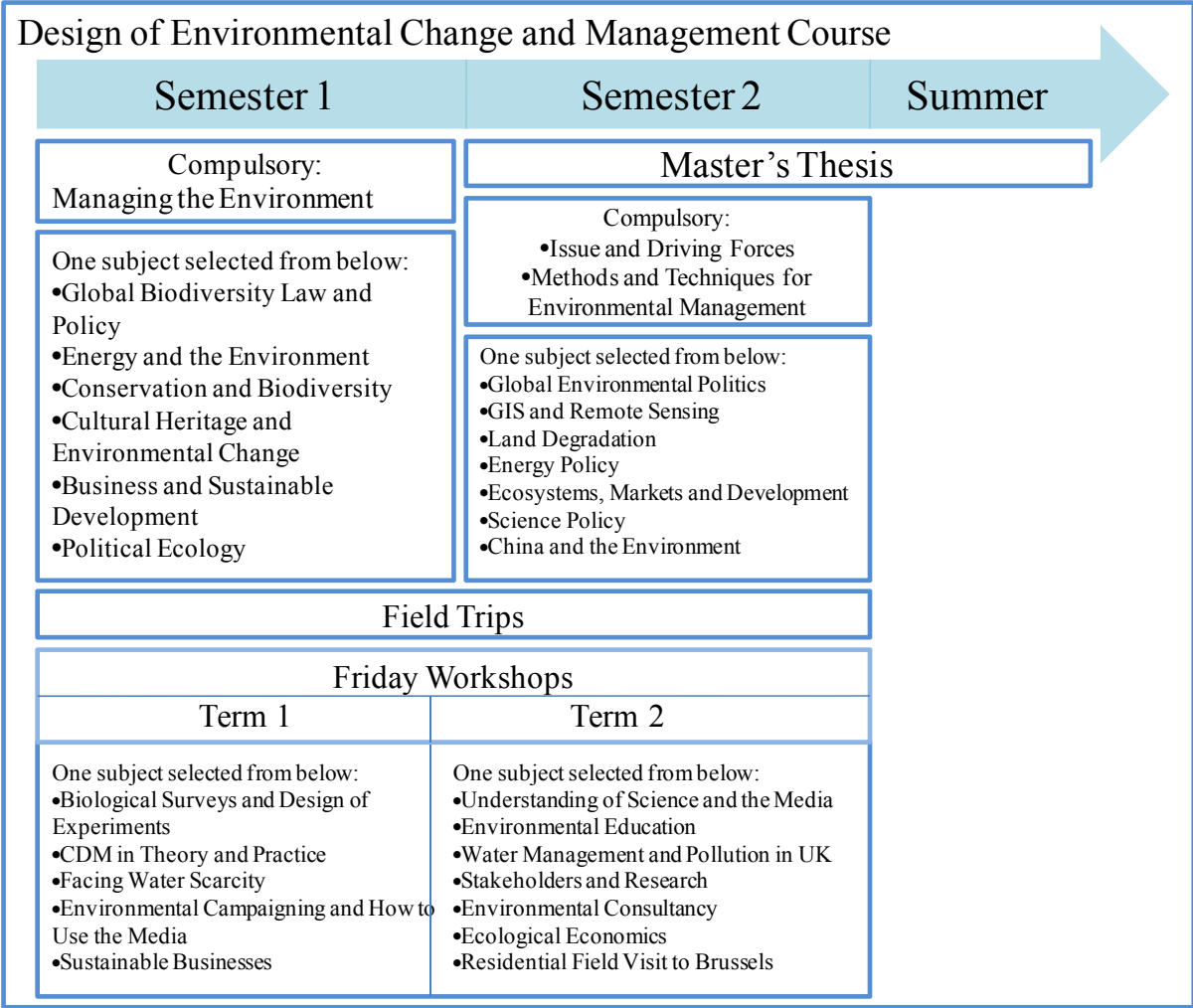


Table 14: List of Course Subject

Term	Compulsory/ Option	Subject	Class format/Method of assessment	Number of Credits
Term 1	Compulsory	Managing the Environment	lectures, fundamental calculations, discussion, modeling, sociology/ecology experimental design, data collection	N/A
Term 2		Issues and Driving Forces <sup>6</sup>	lectures, seminars	
		Methods and techniques for environmental management	lectures	
Term 1	Option course (one subject)	Global biodiversity law and policy	small-class tutorials, lectures, discussion, essay (under 4000 words)	N/A
Term 2		Energy and the environment		
		Conservation and biodiversity		
		Cultural heritage and environmental change		
		Business and sustainable development		
		Political ecology		
Term 2	Option course (one subject)	Global environmental politics		N/A
		GIS and remote sensing		
		Land degradation		
		Energy policy		
		Ecosystems, markets and development		
		Science policy		
Terms 1&2	Options (one subject each term)	China and the environment	lectures, discussion, reports	N/A
		Friday Workshops <u>Term 1</u> <ul style="list-style-type: none"> <li>• Biological surveys and design of experiments</li> <li>• CDM in theory and practice</li> <li>• Facing water scarcity</li> <li>• Environmental campaigning and how to use the media</li> <li>• Sustainable businesses</li> </ul> <u>Term 2</u> <ul style="list-style-type: none"> <li>• Understanding of science and the media</li> <li>• Environmental education</li> <li>• Water management and pollution in UK</li> <li>• Stakeholders and research</li> <li>• Environmental consultancy</li> <li>• Ecological economics</li> </ul>		
All year	Compulsory	Field Trips (See Section 4, subsection (5) for details)	No class assessment	none
Terms 2, 3, and summer	Compulsory	Master's thesis	15,000 words	60

<sup>6</sup> Lecture topics include: Climate change, Water issues, Population ecology, Deforestation, Energy, Sea level change and coastal management, Desertification, Salinisation, Soil erosion, and Global climate change and geomorphologic consequences.

#### **(4) Distinguishing Characteristics of Educational Methodology**

Most of the compulsory and optional courses are made up of lectures, presentations and discussion, with group work included depending on the course. Compared to the compulsory courses aimed at all students, optional courses have small student numbers, offering an atmosphere for conversation-like discussion to occur naturally. Teachers see to it that students who rarely speak up in class are prompted to participate.

A common point for all courses is the requirement of study prior to class. Students read selections from reading lists distributed in advance, and are presumed to have a basic understanding of class topics. This type of preparatory study for participation in class is required because classes are designed to cover content which cannot be covered by independent study alone, such as detailed understanding or the exchange of differing opinions on topics. In this way, the quality of classes is improved. Furthermore, for each class one student with excellent grades is appointed to act as the representative, who promotes the maintenance of class quality and learning among students.

#### **(5) Method of Course Assessment**

Course assessment is conducted according to the following methods.

Environmental Change and Management MSc:

Optional courses (2 subjects) : 10% each (Assessment based on essays)

Compulsory courses (3 subjects): 15% each (Assessment based on written examinations)

Master's thesis: 35%

Grades above 50% must be received in more than 3 subjects for completion of course.

#### **(6) Method of Academic Staff Assessment**

At the end of the semester, surveys by questionnaire are conducted by which students evaluate academic staff and courses. Survey results are submitted to the school director, who provides feedback.

#### **(7) Process of Curriculum Design**

Curriculum development was conducted by the predecessor to the current school, the graduate school of the School of Geography and Oxford University. Due to cooperative relationships with other graduate schools of the university, students are allowed to take classes from other schools upon consultation with instructors.

#### **(8) Facilities**

The following facilities are provided in the school.

- Computers for student use
- Main Library (7,428,000 total volumes as of 2006), 5,525,000 volumes included in on-line catalogue, web-learning, 30 reading rooms)
- Geography and Environment Library (150,000 total volumes, on-line database, web-learning, etc.)
- ECI Library
- Printing service (ECI provides Environmental Change and Management master's course students with 300 pages of free monochrome printing, and 10 pages of free color printing.)



## **(9) External Funding**

External funding is not utilised. Administrative costs for the school are covered in full by tuition. Further, tuition for students from the UK and EU is 6,500 GBP, while tuition for international students from countries outside the EU is 13,450 GBP.

Various costs related to internships and scholarships are covered by cooperating institutions.

## **(10) Method of Programme Auditing**

There are two methods of auditing by external organs. The first is the Teaching Quality Audit (TQA), which is conducted at the frequency of once every five years by the Higher Education Funding Council of England (HEFCE). The second is the National Research Assessment Exercise (RAE). This auditing is conducted once every few years on an irregular basis by the HEFCE, the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland (DEL). (Past inquiries were conducted in 1986, 1989, 1992, 1996 and 2001.) The first type of audit is an overall examination of programmes, including programme content, methods of instruction, and so forth. The second type focuses auditing on research.

## **4. Relationships with External Organisations and Communities**

The following types of cooperative relationships were found.

### **(1) Internships**

Internships are conducted in the three-month period after the end of the semester (period for preparation of master's thesis). ECI hosts about 15 master's students. Content is mainly research assistance for researchers.

Other hosts include Earthwatch and the European Investment Bank. These internships are realised through the individual networks of ECI staff. Further, students are paid about 1,000 GBP per month to cover miscellaneous expenses, but this is not considered to be salary.

### **(2) Scholarship Programmes**

There are two different types of scholarships. The first type provides assistance for course fees, research expenses and living expenses, etc. The second type supports hosting students to assist in research and provision of instruction for master's theses. See appendices for information on the former. Host institutions for the former include SEI and EcoSecurities.

### **(3) Master's Thesis Instruction**

If NGOs or businesses have needs that match student research topics, they will provide instruction and necessary information or funding for preparation of the master's thesis. Upon student request, instructors will at times use their personal networks to request thesis instruction from related external organisations.

#### **(4) Special Lecturer Visits**

Special instructors are brought in to conduct lectures, particularly for the initial one to two-week Interdisciplinary Module and for Friday Workshops.

#### **(5) Hosts of Field Trips (Environmental Change and Management programme only)**

Hosts of field trips cooperate in visits to facilities and student discussions. For the field trip to Brussels, cooperation is obtained from a greater variety of institutions compared to that of field trips within the UK. Discussions with related persons and activists of the European Union Committee, research institutions and NGOs are included in the field trip.

Example field trip schedule (2008-2009)

- ① Friday 3 October – Sunday 5 October 2008  
Host: Slapton Field Centre, South Devon  
Topic: “Management issues in a national nature reserve and along a changing coastline”
- ② Wednesday 5 November 2008  
Host: Wytham Woods (Oxford)  
Topic: “Woodland ecology and management”
- ③ Thursday 6 November – Saturday 8 November 2008  
Host: South Downs (Brighton, East Sussex)  
Topics: “Management issues in an environmentally sensitive area (ESA) and the future South Downs National Park”  
“Flooding and erosions”  
“Chalk grassland, local nature reserve and environmental education”
- ④ Thursday 29 January – Saturday 31 January 2009  
Host: Centre for Alternative Technology (Wales)  
Topic: “Evaluating alternative energy sources and their impacts”
- ⑤ Thursday 12 March – Saturday 14 March 2009  
Destination: Brussels, Belgium  
Topic: “EU environmental policy”
- ⑥ Sunday 26 April – Wednesday 29 April 2009  
Host: Blencathra Field Centre (Cumbria)  
Topic: “Management issues in a National Park (the Lake District)”

ECI covers the costs of all field trips except the Brussels trip. If students are absent without permission, they are held responsible for full costs.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

The following documents are required for application.

- application form
- personal statement including motivation for application
- transcripts of grades
- 3 letters of recommendation (at least two letters must be from a university-related person)
- Proof of English ability, IELTS or TOEFL scores (when required)

Past grades from institution of higher education are weighed heavily in the screening process.

### **(2) Consideration for Mid-career Learners**

There is no particular framework for mid-career learners; however, work experience is an advantage.

### **(3) Recruitment Methods for International Students**

Main recruitment takes place on the university website. As Oxford University is a well-renowned name worldwide, no special public relations activity is conducted for student recruitment. The average yearly ratio of successful applicants is 1 in 10.

## **6. Student Futures**

### **(1) Paths after Graduation**

Approximately 70 percent of graduates from the ECI master's programme find work in research and educational institutions, with others finding work in government (central, local), business, NGOs, international organisations, and so on. There are also a few students who proceed on to doctoral courses.

Examples of workplaces: UK Environment Ministry, Oxfam, EcoSecurities, etc.

### **(2) Methods of Network Building between Graduates**

There is an Alumni Association at ECI, which functions as source of information on reunions and employment opportunities at the university and related organisations, and as a hub for communication between graduates and current students. Participation in the Alumni Association is voluntary, and not all graduates register. Approximately 70 percent of students register at the time of graduation.

## **7. Other**

### **Language**

There has not been any student who required language support in the programme thus far, so there is assumed to be no necessity for such support.

### **Environment-related Research Institutes of the University**

Currently, the University of Oxford established environment-related research institutes in response to growing awareness of environmental issues and social needs to address them.

#### **● The Smith School of Enterprise and the Environment**

This research and educational institute was founded in September of 2008 with the support of the Martin Smith Foundation. The school aims to build cooperative systems to address and solve environmental change issues in the 21<sup>st</sup> century, by providing the private sector, government and educational institutions with a centre for interdisciplinary research and educational activities related to the environment. This institute actively promotes cooperative relationships with existing university institutions, including the Centre for the Environment, the Environmental Change Institute and the Saïd Business School. Current activities involve research for which a few doctoral students from Oxford University are appointed as research fellows.<sup>7</sup> Merits for the doctoral students include the opportunity to hear the opinions of persons from differing sectors, and to gain the latest information available on their research topics. However, as the school was only just established, details on its future activities are still in the stage of deliberations with related organisations.

Moreover, while the centre of current activities is the Oxford region, meetings are being held with government-related parties regarding the development of cooperative setups in London, particularly with the business sector.

#### **● The James Martin 21<sup>st</sup> Century School**

This school was founded in June of 2005 with the objective of searching for solutions to international problems and ensuring opportunities for the future. It aims to support scholarship to assist in promoting global understanding and action on pressing human problems. Toward this purpose, the school runs a research funding programme, which gives funding support to innovative and interdisciplinary projects within Oxford University. Emphasis is put on ensuring research results that can be reflected on policy to bring about positive changes.

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<sup>7</sup> There are currently seven research topics. 1. Environmental Modelling, Forecasting, and Climate Policy, 2. Climate Change Economics and Policy, 3. Enterprise as Change Agents in 21<sup>st</sup> Century Society, 4. Economic Policies to Reduce CO<sub>2</sub> Emissions in the Transport Sector, 5. The Evolution of the Carbon Market, 6. Climate Governance, Corporate Climate Strategies, and International Development, and 7. Fuels of the Future.

## **8. Summary of Research Results**

As Oxford University has a long history as one of the top universities in the world, a great deal of effort is focused on the maintenance and improvement of the level of education. Oxford holds fast to the traditional standpoint that the augmentation of knowledge and mastering of concepts form the premise of university education, recognizing that responsibility for university education lies with the university itself. For this reason, rather than development of talent to address societal needs, importance is attached to improvement of academic ability and enhancing the expertise of students. Businesses and research institutions make offers for joint research and scholarships counting on the high level of research at Oxford. Thus, based on the university's relationships with external organisations, the university's stance on education can be viewed to in effect respond to societal needs.

In 14 short years of history since its founding, the Environmental Change and Management programme (MSc) of Oxford University has developed upon the foundation of the university's high-level education and trust in its educational quality, as well as cooperative relationships with external organisations. For this reason, the programme has developed from its founding to current times without facing any major obstacles. Further, due to a strong system of mutual cooperation within the university, environment programmes of the university are running smoothly.

The short one-year master's course of the UK has an extremely intensive course design. Students are required to concentrate on coursework (nine months) and master's thesis research (three months). Within the traditional view of the university, the graduate school is an academic institution that conducts high-level education. Thus, emphasis is placed not on "training" professionals fitting to society, but on practicing "education" for the purpose of improving the academic level of students. As a result, students with work experience most often enter master's and doctoral programmes with the aim of augmenting expertise and mastering concepts. From the same perspective, employment and internships during the semester are not recommended for students.

Knowledge on the environment is cultivated through courses (modules). Classes also employ a variety of methods to bolster interpersonal skills, including seminars, presentations, group work, and fieldwork. Teaching is not a one-directional relaying of knowledge from teacher to student, rather efforts are made to learn from each other through discussions and so on. However, while instructors recognise that interpersonal skills can be developed in the programme to a certain extent, whether or not a student can make use of these skills in actual society depends greatly on the qualities of the individual.

One distinguishing characteristic of this school's programme is the fact that participation in fieldwork is mandatory. Through experiencing visits to a variety of sites, students are given valuable opportunities to hear directly from concerned parties.

The aim of the school is for students themselves to deepen their understanding of the interdisciplinary nature of the environment. Students are expected to achieve this goal through classes in a variety of fields, as well as discussions and mutual stimulation between students of diverse backgrounds.

Because the university is highly influential in the community, when a project is started up, the university takes the leading role in most cases. The university rarely participates actively in projects led by local governments or other organisations with differing systems of decision-making. In the interviewing for this research, interviewers were strongly impressed that Oxford University maintains a resolute independence as an institution of higher education.

In general, as there have not been any particular troubles related to administration of the programmes of this school since the time of its establishment, there appears to be no movement to change current administrative methods. However, it is necessary to continue to adjust the programme to the latest information and conditions of the environment in order to maintain and improve the quality of programmes. As such, the school aspires to continue to make contributions to the development of superior human talent.

## Appendices

### 1. List of Interview Subjects

Prof. John Boardman	Emeritus Fellow, Geomorphology and Land Degradation Environmental Change Institute
Dr. Thomas E. Downing	Director, Oxford Centre, Stockholm Environment Institute Visiting Fellow, Queen Elizabeth House, University of Oxford
Mr. Aaron Holdway	Smith School of Enterprise and the Environment University of Oxford
Dr. Paul Jepson	Senior Research Fellow in Conservation Practice Course Coordinator of MSc in Nature, Society and Environmental Policy Environmental Change Institute
Ms. Maria Mansfield	Information Officer, Events & Affiliates Environmental Change Institute
Dr. Tom Thornton	Director of MSc Environmental Change and Management Environmental Change Institute

### 2. List of Reference Materials

- Environmental Change Institute, *MSc Environmental Change & Management Course Information Pack 2007-08*, University of Oxford
- Environmental Change Institute, *MSc Environmental Change & Management Course Information 2008-09*, University of Oxford
- Environmental Change Institute, *MSc Environmental Change & Management Option Courses 2008-09*, University of Oxford
- Environmental Change Institute, *Environmental Change Institute Review 2007/08*, University of Oxford
- School of Geography and the Environment, *MSc Biodiversity, Conservation and Management Course Handbook 2008/09*, University of Oxford
- School of Geography and the Environment, *Society and Environmental Policy Course Handbook 2008/09*, University of Oxford
- School of Geography and the Environment, *MSc Nature, Society and Environmental Policy ANNEX I: CORE MODULE OUTLINES 2008/09*, University of Oxford
- School of Geography and the Environment, *MSc Water Science, Policy and Management Course Handbook 2008/09*, University of Oxford
- The Smith School of Enterprise and the Environment, *The Smith School of Enterprise and the Environment: Brochure*, University of Oxford
- The James Martin 21st Century School, *The James Martin 21st Century School: Brochure*, University of Oxford
- The James Martin 21st Century School, *The James Martin 21st Century School: Winter Newsletter*, University of Oxford, December, 2008
- The James Martin 21st Century School, *The Future?*, University of Oxford
- University of Oxford, *Blue Print: Staff News for the University of Oxford*, December, 2008

Other Materials Obtained:

Research at the Smith School –Draft

The Bodleian Library Information

List of graduates' workplaces and analysis diagram (Environmental Change Institute)

Master of Science in Environmental Change and Management, Paper 1: ISSUES AND DRIVING FORCES, Trinity Term 2007 (Exam Paper, provided by Dr. Tom Thornton)

Master of Science in Environmental Change and Management , Paper 2: MANAGING THE ENVIRONMENT, Trinity Term 2007 (Exam Paper, provided by Dr. Tom Thornton)

Master of Science in Environmental Change and Management – Paper 3: METHODS AND TECHNIQUES FOR ENVIRONMENTAL MANAGEMENT, Trinity Term 2007 (Exam Paper, provided by Dr. Tom Thornton)

MSc Environmental Change and Management Class List, 2008-09



## ■ Newcastle University Law School (graduate school), Programme in Environmental Law and Policy

### 1. Outline of the Environmental Law and Policy Specialty of the Law School

#### (1) Background of Establishment

The Newcastle University Law School was founded in 1923 as a college of Durham University. It was then founded independently as Newcastle University in 1963, when the demand for institutions of higher education was on the rise in the UK. The Law School was also established on its own at this time. In 1994, the Faculty of Law became a department within the Faculty of Law, Environment and Social Sciences (the current Law School). In 2002, in a restructuring of faculties, the Law School became one of eight schools in the newly established Faculty of Humanities and Social Sciences.

In the late 1990s, the Master of Law (LLM) in Environmental Law and Policy was established to address rising research needs in the field of law and the environment. Environmental law and environmental policy were introduced into the traditional law programme. The world renowned environmental law scholar Professor Rodgers of the Law School took a leading role in the establishment of the programme. His considerable efforts at the time of programme establishment, including utilisation of his broad personal network, have been acknowledged.

#### (2) Aims of Programme

The programme aims to augment understanding of the environment from the perspective of law, and to enable students to acquire the following knowledge and abilities.

- specialised legal knowledge and legal skills in the subject matter of environmental law and policy
- specialised knowledge in other related areas
- general understanding of the nature of law and regulation, and greater understanding of the field of environmental law and policy
- research, organisational and presentation skills, and the capacity for independent learning

#### (3) Basic Concepts of Education and Research

One characteristic of this programme is that while law is central to curriculum development, great emphasis is put on an interdisciplinary perspective toward the environment. In class work, the establishment of an academic foundation through teaching of specialised knowledge and concepts is combined with the intention to develop an interdisciplinary perspective. Such a perspective will allow students to take a variety of factors and influences into consideration when deliberating the environment. Through discussions among students and between students and professor in class, every attempt is made to achieve mutual learning.

**(4) Academic Staff and Student Numbers**

There are currently eight students enrolled in the programme, of which two are mid-career learners. Of the eight, three are from the UK, two from EU, and three international students from Africa. There are five male students to three female, and the average age is in the 20’s. There are eight students in the doctoral programme as well.

The Law School is comprised of 36 staff members (see table 8 for details). There are three experts in environmental law, from whom students in the environmental law and policy specialty gain high quality educational instruction. Students also enjoy the benefits of the networks of these experts.

Table 15: Staff Numbers of the Law School (graduate school only)

	Number of persons
Head of School	1
Programme Directors	3
Full-time lecturers	20
Part-time lecturers	4
Research assistants	1
Library staff	4
Office staff	3
Total	36

**2. Image of Ideal Talent (Environmental Leader Concept)**

This programme aims to develop leaders to tackle environmental problems—those who have both the ability to broadly view environmental problems from an interdisciplinary perspective and a high level of motivation.

Essential features of the environmental leader are an interdisciplinary perspective on environment, an expert knowledge base in knowledge and concepts related to the study of law and environmental studies, communication skills, management ability, critical thinking, and the ability to explain the complexity of the environment to a non-expert in a way he or she will understand.

**3. Educational Curriculum**

**(1) Outline of Educational Curriculum**

The curriculum of the Environmental Law and Policy programme is made up of one compulsory course, three optional courses, and the master’s thesis. Research is conducted either with one of the school’s research groups, or in some cases in the form of joint research with external organisations. Preparation of the master’s thesis is conducted over a three-month period. The programme offers a one-year full-time and two-year part-time programme, but conditions for completion and curriculum content are the same. From the viewpoint of training professionals, fieldwork and guest lectures are included. In carrying out such curriculum, the programme contrives to allow students to experience themselves the relationship between actual society and content covered in classes and research.

## (2) Distinguishing Characteristics of Curriculum

One distinguishing characteristic of curriculum is that while law is the axial area of study, the programme is organised to be interdisciplinary. In the background of this characteristic is the present state of affairs, where the development of international law has led to increasingly complex law concepts and theory, and where problems related to environmental regulations are worsening. An interdisciplinary perspective has come to be demanded when considering environmental problems related to law. Interdisciplinary programme organisation is also utilised in instructing students in their master's theses, and in some cases students receive instruction from academic staff of other research departments. Cooperative relationships for research instruction from other departments are carried out with relative flexibility based on discussion between teaching staff of the law department.

Further, the four master's programmes of the school share the same modules. The module which is compulsory differs according to speciality.

## (3) Course Subjects

Figure 7: Design of Environmental Law and Policy Master's Course

Design of Environmental Law and Policy Master's Course (180 credits for graduation)		
Semester 1	Semester 2	Summer
Compulsory: Foundations of Environmental Law and Policy		Master's Thesis
Optional Courses (3 subjects for Semesters 1&2 together)		
Semester 1	Semester 2	
<ul style="list-style-type: none"> <li>•International Poetry and Competition</li> </ul>	<ul style="list-style-type: none"> <li>•Law of International Commerce</li> <li>•European Environmental Law</li> <li>•International Environmental Law</li> <li>•International Financial Regulation</li> <li>•The Law of WTO and GATT</li> <li>•Environmental Law and Environmental Rights</li> <li>•Corporate Governance and Corporate Finance</li> <li>•Economic Integration and the European Union</li> <li>•Foundations of Public International Law</li> <li>•Planning Law and Environmental Impact</li> <li>•Human Rights and Development</li> </ul>	

Table 16: List of Course Subjects

Term	Compulsory/ Option	Subject	Class format/Method of assessment	Number of credits
Semesters 1 & 2	Compulsory	Foundations of Environmental Law and Policy	Written examination (135 minutes, Semester 2), 3,000 word essay (Semester 1 or 2)	30 each
	Option courses (three subjects)	Law of International Commerce	Written examination (180 minutes, Semester 2)	
		European Environmental Law	Written examination (135 minutes, Semester 2), 3,000 word essay (Semester 1 or 2)	
		International Environmental Law	Written examination (135 minutes, Semester 2), 3,000 word essay (Semester 1 or 2)	
		International Financial Regulation	Written examination (135 minutes, Semester 2), 3,000 word essay	
		The Law of WTO and GATT	Written examination (180 minutes, Semester 2)	
		Environmental Law and Environmental Rights	Written examination (135 minutes, Semester 2), 3,000 word essay (Semester 1 or 2)	
		Corporate Governance and Corporate Finance	Two 3,000 word essays	
		Economic Integration and the European Union	N/A	
		Foundations of Public International Law	Written examination (135 minutes, Semester 2), 3,000 word essay (Semester 1 or 2)	
		Planning Law and Environmental Impact	Two 6,000 word essays	
		Human Rights and Development	Written examination (134 minutes, Semester 2), coursework (3,000 words, 50%)	
		Semester 1		
Semester 3	Compulsory	Dissertation preparation and dissertation	10,000 to 15,000 words	60

#### **(4) Distinguishing Characteristics of Educational Methodology**

Classes are conducted in seminar format, with readings, question and answer sessions, discussion and so on. Discussion in particular is actively included in class, with the objective of student-led classes. Students are encouraged to actively speak up in class.

#### **(5) Method of Course Assessment**

##### Example

##### Foundations of Environmental Law and Policy

Assessment: 135 minute examination, coursework (within 3,000 words) for 50 percent of grade.

Course content:

- Legal notions of the environment and pollution.
- Fundamental environmental principles, particularly the polluter pays principle and the precautionary principle.
- Private/civil law mechanisms: negligence and trespass, nuisance, property rights, management agreements/contract, water rights.
- Remedies: damages and injunctions.

##### European Environmental Law

Assessment: 135 minute examination, coursework (within 3,000 words) for 50 percent of grade.

Course content:

- Environmental law in the EC Treaty
- Law making powers and environmental regulation
- Principles and objectives of EC environmental law
- Environmental law and the single market
- Environmental regulation (protection of biodiversity, integrated pollution prevention and control, water pollution)

The course aims for students to acquire knowledge and understanding of the key principles of European Community environmental law.

#### **(6) Method of Academic Staff Assessment**

All courses are subject to screening via a questionnaire produced by the Board of Studies. Further, are courses are targeted for student questionnaires concerning classes and the overall programme. Likewise, every year a national student survey is conducted for fourth year undergraduate students. This survey includes question topics related to the quality of learning and teaching at institutions of higher education.

#### **(7) Process of Curriculum Design**

Curriculum design is conducted by deliberative meetings of the academic staff of the school. There are no particular consultations with external organisations at this stage.

## **(8) Facilities**

Many facilities are available, including lecture halls, conference rooms, seminar rooms, student lounges, work spaces for student research, the main library, the law school library (approximately 190 person capacity, equipped with discussion rooms), and computer rooms. The Law Library contains the latest materials in law research, with an approximately 30,000 volume collection. In the computer rooms, it is possible for students to do word-processing, data management and printing. Access is also available to the Internet, e-mail, e-learning, Westlaw (a database for law-related materials), and on-line searches engines for law-related texts and databases.

## **(9) External Funding**

The UK has various Councils for distributing government funding to universities. Allocated amounts are determined by the scale of the university, number of students, the scale of research, and so on. The Law School receives funding support from the Economic and Social Research Council and the Arts and Humanities Research Council.

Department and programme administrative funds are mainly covered by student tuition. Tuition is first collected by the university, and then administrative funds are allocated to various faculties based on student and programme numbers. Tuition for UK and EU students is 4,195 GBP (full-time) and 2,100 GBP (part-time). Tuition for international students from outside the EU is 10,215 GBP.

## **(10) Method of Programme Auditing**

The Board of Studies conducts an annual audit and review of the master's programme. Results are reported to the Faculty Teaching and Learning Committee, where the year's review and items for adjustments for the following year are deliberated.

There are two methods of auditing by external organs. The first is the Teaching Quality Audit (TQA), which is conducted at the frequency of once every five years by the Higher Education Funding Council of England (HEFCE). The second is the National Research Assessment Exercise (RAE). This auditing is conducted once every few years on an irregular basis by the HEFCE, the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland (DEL). (Past inquiries were conducted in 1986, 1989, 1992, 1996 and 2001.) The first type of audit is an overall examination of programmes, including programme content, methods of instruction, and so forth. The second type focuses auditing on research.

#### **4. Relationships with External Organisations and Communities**

One case in point of cooperation between other research departments in the university is the option for students to undertake courses outside of their respective research departments. For example, there is currently an agricultural engineering student taking a class at the Law School. Law School students are also allowed to take classes from other research departments based on consultation with instructors.

Regarding cooperative relationships with external organisations, some exchange takes place with the local community and community scholars in agricultural law. While opinion exchange takes place on an informal basis, there is very little cooperation in relation to courses. In some cases, cooperation takes place for student research and thesis instruction. There is also some cooperation with international organisations and US and Canadian universities related to research projects, but none related to classes or curriculum. The university has exchange agreements with universities in Malaysia and China, but the Law School does not benefit from these. Nevertheless, there is the potential for the Law School to enlarge its networks by utilising the existing networks and partnerships of the university.

A cooperative relationship especially for student research support is the Environmental Science Student Partnership. Funding for this programme, which is implemented to give research instruction to doctoral course students, is provided by the English Nature Biology Agency. Another programme providing support for the research of doctoral course students is the UK Research Council Studentship programme.

An informal cooperative relationship is the Environmental Agency internship programme. After completing all coursework, one or two students participate in a three-month internship.

#### **5. Conditions for Admission**

##### **(1) Evaluation Standards for Selection of Applicants**

The following documents are required for application.

- Application form (including a personal statement and names of referees)
- Transcripts of grades
- Proof of English ability in the form of IELTS or TOEFL scores (required for international students who are not native English speakers)

In order to maintain quality of students at the Law School, standards for evaluation of applicants are set higher than that of other departments. The utmost importance is attached to top-of-class grades from institutions of higher education as a condition of admission. International students are required to submit an IELTS score as proof of English ability. While other departments require a score of 6 to 6.5 or above, the Law School's standard is a score above 7. Students with IELTS scores of 6.5 are granted admission based on undergoing a language course pre-session (5 weeks) before the start of the programme. Students with scores under 6 can take a pre-master's course (English course) prior to September or January enrolment in the main master's course.

A background in law is not a requirement of admission, and as such students with backgrounds in various areas are admitted.

## **(2) Considerations for Mid-career Learners**

There is no particular framework for mid-career learners; however, work experience is an advantage in admissions screening. A part-time programme of the same content is set up to allow mid-career learners to complete the master's degree while continuing to work.

## **(3) Recruitment Methods for International Students**

International students are recruited on the website and around the world through the public relations activities of the British Council, as well as through utilisation of individual networks. The university's good environment for students is a particular selling point, such as the safety of the community of Newcastle and the fact that living expenses are fewer compared to the city.

## **6. Student Futures**

### **(1) Paths after Graduation**

Many students after graduation become law experts or judges working at courts, law offices, NGOs, government agencies, and so on. Most international students return to their home countries and pursue similar career paths related to law.

### **(2) Methods of Network Building between Graduates**

There is not any particular network, but professors and graduates remain in contact after graduation on an individual basis.

## **7. Other**

### **(1) Scholarships**

Scholarships for the university and Law School are very limited. There are two types of scholarships, one targeted at research students, and one targeted at master's course students. The ORS Scholarships are targeted at research students. The framework for selection is limited to a very few persons. Thus, distinguished foreign research students with excellent research ability are the targets of this scholarship. Researchers from the UK and EU countries use Research Council awards.

International Taught Postgraduate Scholarships are available for master's course students. Further, Newcastle University International Taught Postgraduate Scholarships are available to both research students and master's course students. Scholarships of 1,000 GBP per year are granted to international students who are studying at their own expense.



## **8. Summary of Research Results**

The Law School fundamentally emphasises establishment of an academic foundation through the augmentation of specialised knowledge, predicated on the traditional view of the university. The school aims to development experts in the field of law. However, the programme recognises the need for an interdisciplinary perspective and understanding for research in the field of environment. Thus, the environmental law and policy programme gives consideration to broadening the interdisciplinary perspective of students while basing its curriculum in law. This sort of flexibility is a response to increasingly complex environmental laws and regulations which have accompanied environmental problems in recent years, not only in the UK, but in the EU and on a global scale.

Interdisciplinary programme design is also utilised in master's thesis instruction, and students are allowed to receive instruction from academic staff of other research departments. Cooperation with other departments for research instruction takes place in a relatively flexible manner through consultations between teaching staff of the Law School. The programme does not require a background in law or other particular field as a condition of admission, thus students with diverse backgrounds enrol in study. This system makes a large contribution to broadening perspective and understanding in students. As programme participants are few, students have comparatively numerous opportunities to assert personal opinions, and mutual learning between students, as well as between teacher and students, flourishes in the classroom. Curriculum aims not only at enrichment of areas of speciality, but also contrives to instil interpersonal skills and other skills fitting to experts and researchers, including research and organisational ability, presentation skills, and independent study skills. For example, active student participation in class is encouraged through class discussions and presentations. The programme aims to achieve not teacher-led, but student-led classes.

A topic of concern for the programme is the continued acquirement of excellent students from around the world. It is necessary to invent a plan for student recruitment to maintain numbers. To ensure quality of students, continued maintenance of high admissions standards (higher than those of other schools) is effective. Updating of programme content on an ongoing basis is also recognised to be important in continuing to offer an appealing programme for students. However, changes in programme content and establishment of new subjects or programmes requires petition to the university. For this reason, the centralised power bureaucratic system of the university often acts as an obstacle to reform aimed at increased efficiency and improvement of programme quality. On this point, there is need for raising awareness not only at the school level, but on the level of the university as a whole.

The programme takes a stance to address the conditions and needs of present society, through the active inclusion of an interdisciplinary perspective on the environment into law, one of the most traditional and conservative fields. The school is considering strengthening cooperative relationships with external organisations, as well as establishment of new courses. The school plans to continue to enrich the programme and produce persons of talent.

## Appendices

### 1. List of Interview Subjects

<b>Name</b>	<b>Position</b>
Miss Ilona Cheyne	Senior Lecturer
Prof. Joanna Gray	Director, LLM Taught Degrees
Mr. Ole Pedersen	Lecturer in Law
Prof. Christopher Rodgers	Professor of Law

### 2. List of Reference Materials

HEFCE, <http://www.hefce.ac.uk/>, (Accessed 26, February, 2009)  
Law School, *Postgraduate Studies in Law*, Newcastle University  
RAE 2008, <http://www.rae.ac.uk/aboutus/>, (Accessed 26, February, 2009)

Other Materials Obtained:

Brochure of Institute for Research on Environment & Sustainability  
Leaflet of Postgraduate Studies in Law, Compulsory and Optional Modules for the taught LLM Programmes  
Library Guide to Robinson Library, Walton Library, Law Library  
Newcastle Law School, LLM Programmes 2008-2009: Module Description Booklet  
Programme Specification of LLM in Environmental Law and Policy  
University Library, Politics Information Sources  
University Library, Environment Sources  
University Library, Official Statistics  
University Library, Government Publications  
University Library, Health and Social Statistics

## ■Newcastle University School of Civil Engineering and Geosciences Environmental Engineering Programme

### 1. Outline of the School of Civil Engineering and Geosciences

#### (1) Background of Establishment

The foundation of the School of Civil Engineering and Geosciences was established in 1945 by William Cassie. At the time, there was no word or concept for “environment”, rather what we now call “environment” was recognised as “public works”. The School itself was founded in 1963 with the aim of conferring bachelor’s degrees in science and engineering fields to build knowledge in environmental engineering. With rising global interest in the issue of climate change from the 1970s, the school chose to expand the environment-related content of the field of civil engineering. Expansion of programme content was planned with the recognition that the development of a different type of research was essential. Namely, in order to conduct research genuinely applicable to solving environmental problems, it was necessary to develop persons of talent not only with expert knowledge and technique in civil engineering, but also those who could manage the environment comprehensively, inclusively and continually.

In 2002, the university underwent a major restructuring based on the judgement that stable administration of a small number of large schools was more feasible than administration of a large number of small-scale schools. The three schools of civil engineering, geomatics and geosciences were combined into the current School of Civil Engineering and Geosciences. The school is highly regarded and currently ranked number two in the UK of graduate schools in civil engineering.

#### (2) Aims of School

One distinguishing characteristic of this school stems from its aim to contribute to the overall design of an environmentally conscious society. From this perspective, students of diverse backgrounds gain understanding of concepts, practical knowledge and expert techniques, to build career skills as environmental engineers and researchers related to water, waste, and environmental industry.

The programme aims to promote student’s augmentation of expert knowledge and acquisition of practical skills, toward the development of professionals. For this reason, in addition to teaching expert knowledge and concepts based on traditional teaching methods, practicums and fieldwork including actual joint projects with local governments on social planning projects are actively included in curriculum. In this manner, programme design is geared to comprehensively strengthen and cultivate knowledge and skills as professionals.

#### (3) Basic Concepts of Education and Research

One distinguishing characteristic of this school is that while civil engineering and geosciences are central to curriculum development, the programme is designed to cultivate an interdisciplinary perspective toward the environment. In addition to the establishment of an academic foundation through teaching of expert knowledge and concepts, it also aims to develop skills necessary for the professional, such as social design and project management ability. For this reason, much of the curriculum contains experiments and fieldwork and is designed to achieve a balance between expert knowledge and interpersonal skills.

The university has traditionally had very close ties with the local community. Consideration is given to maximum reflection of the needs and opinions of local society on programme concepts, via periodic opinion exchange with local industry and NGOs. Additionally, the level and quality of the school's research is highly regarded, not only by local industry and groups, but also by environment-related research centres in the UK and organisations that determine the direction of government policy. In order to utilise this high-level pioneering research toward student development, the school is presently discussing ways to link research activities and educational programmes.

#### **(4) Academic Staff and Student Numbers**

There are presently 24 people enrolled in postgraduate courses, of whom 22 are master's candidates and two are diploma candidates. Nationalities of students vary, with approximately 40 percent from the UK, 35 percent from Nigeria and 25 percent from other countries. No particular heed is given to nationality in the admissions selection process, but attention is paid to attaining a balance between UK students and international students. This consideration allows UK students to give assistance in class work and research to international students who are not native English speakers. Currently, 12 of the master's students are over 25 years of age. There are 21 full-time students and two part-time. (Details on the nationalities of students enrolled in the 2008 course are: 9 UK, 8 Nigeria, 2 France, 2 India, 2 Syria and 1 China.)

There are 91 staff members at the school (17 office staff, 20 technical staff, 52 academic staff, and 2 teaching staff). The large number of technical staff is necessary to maintain the several laboratories at the school equipped with specialised instruments. It is mainly the academic staff and teaching staff that are actually involved in student instruction and education.

#### **2. Image of Ideal Talent (Environmental Leader Concept)**

The programme aims for students to learn "how to protect, in a sustainable way, human health and the environment by being able to conceive, plan and communicate ways to collect, treat and distribute clean water, to collect, treat and reuse or dispose of wastewater and wastes, and to remediate and reclaim contaminated land." (School of Civil Engineering and Geosciences, *MSc & Diploma in Environmental Engineering Handbook 2008/2009*, Newcastle University, p. 3.) The school aims to produce specialists who can contribute to problem solving in actual society, related to environmental and urban issues.

The school considers the following qualities to be important for the environmental leader.

- Project design skills and social design from the perspective of sustainability
- Group work skills
- Communication skills
- Management ability
- Networking ability
- Qualitative ability
- Broad understanding of sustainability
- Ability to coalesce a variety of knowledge into comprehensive thinking
- Sense of responsibility
- Ability to assert oneself

Curriculum design is geared to training in these abilities. The curriculum content can be broadly divided into analysis and research methodology, academic specialist knowledge, and master's dissertation research. The programme contrives to include a variety of teaching methods. Through group work, classes attempt to improve upon interpersonal skills, such as communication skills, management and networking ability.

### **3. Educational Curriculum**

#### **(1) Outline of Educational Curriculum**

There are currently 21 master's programmes available at the school, of which the MSc in Environmental Engineering is one. Although there are some differences in the curriculum structure of each programme, there are many common class subjects offered.

The environmental engineering programme curriculum consists of 7 compulsory subjects, 2 elective subjects and the master's dissertation. Preparation for the master's dissertation is carried out in the first and second semesters, and begins in earnest after completion of the coursework. In some cases, research is carried out on research group topics of the school, and in other cases, takes the form of joint research with external organisations. The period for master's dissertation preparation is three months. The programme offers a one-year full-time or two-year part-time option, but the requirements for completion and curriculum design are the same. In order to train professionals, efforts are made to ensure that students physically experience the relationship between actual society and classes and research. This is accomplished through fieldwork and visits of guest speakers.

#### **(2) Distinguishing Characteristics of Educational Curriculum**

The programme aims to realise sustainable development for present and future generations through water treatment and management of systems of circulation.

The short one-year master's programme is extremely intensive. Students concentrate on coursework during the semester, and after completion enter the three-month master's dissertation preparation period. The school aims to combine the development of professionals with traditional education in expert academic knowledge and concepts. Therefore, the school makes efforts to improve student skills by including elements of practical exercise and field practice in the curriculum.

The programme is made up of a combination of two types of courses. The first is the linear type, a course for which classes are held throughout the semester. The second type is called the block type, where classes convene on one subject for a period of two weeks. Based on this system, working students can use leave time from work to undertake coursework with the potential to complete all courses in two years.

### (3) Course Subjects

Figure 8: Design of Environmental Engineering Master's Course

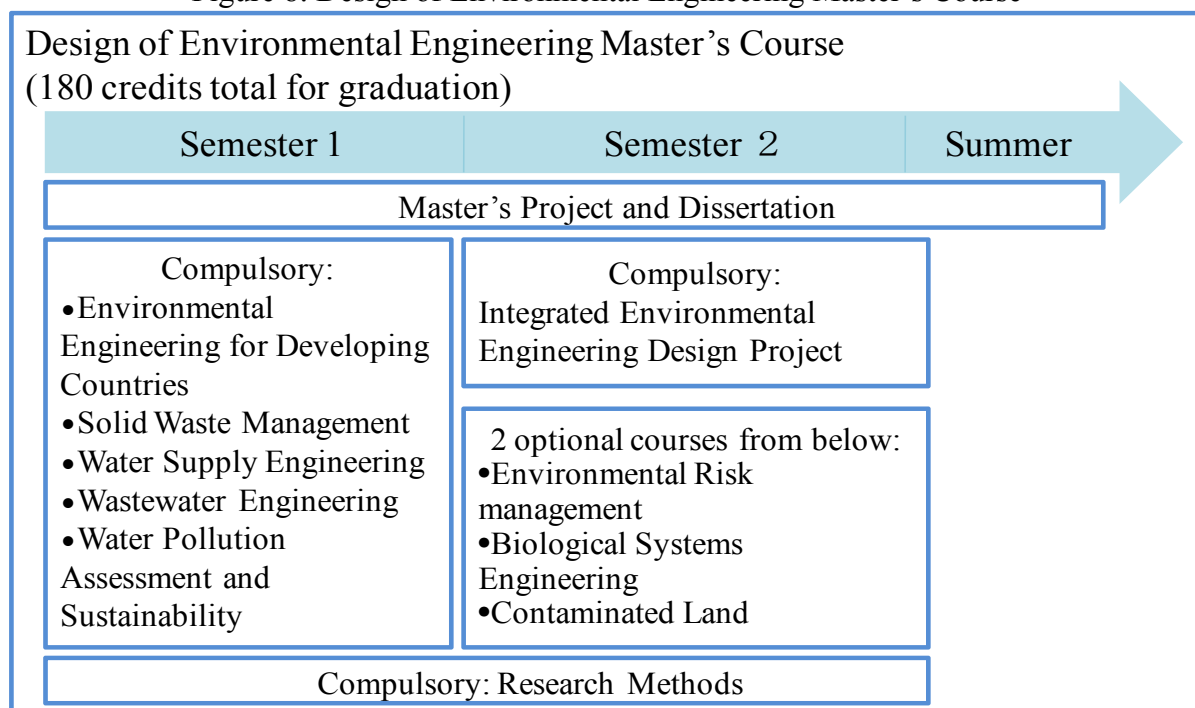


Table 17: List of Course Subjects

Term	Compulsory / Option	Subject	Class format/Method of assessment	Number of Credits
Semesters 1&2	Compulsory	Research Methods	lectures, coursework, written examinations	10
Semester 1		Environmental Engineering for Developing Countries	lectures, seminars of instructor, group work, written examinations, coursework	10
		Solid Waste Management	lectures, tutorials, written examinations	10
		Water Supply Engineering	lectures, tutorials, written examinations, coursework	10
		Wastewater Engineering	lectures, fieldwork, written examinations, class tests	10
		Water Pollution Assessment & Sustainability	lectures, fieldwork, written examinations, coursework	20
Semester 2		Integrated Environmental Engineering Design Project	tutorials, oral examinations, group work (reports, group poster)	10
Semesters 1-3	MSc Project and Dissertation	tutorials, presentations (15 min.), dissertation, poster presentation (A1 size, submitted at the end of August)	80	
Semester 2	Optional modules (20 credits)	Environmental Risk Management	lectures, seminars, tutorials, written examinations	10 each
		Biological Systems Engineering	lectures, workshops, group study/group study report, group study presentation	
		Contaminated Land	lectures, fieldwork, coursework	

#### **(4) Distinguishing Characteristics of Educational Methodology**

Most compulsory and optional courses are made up of lectures, presentations and discussions, with group work, fieldwork and lab work included depending on the course. The main format of classes is a seminar or tutorial format.

#### **(5) Method of Course Assessment**

##### **Example**

##### **Environmental Engineering for Developing Countries**

Grade assessment: coursework (1500 word report) 80%, presentation 20%

Class content:

- diseases and epidemiology
- water resources in arid areas
- low cost water supply technologies
- on-site sanitation
- low cost sewerage
- community participation (Orangi Pilot Project: Pakistan)
- waste stabilisation ponds
- water and sanitation sector reform
- low cost household water treatment
- ceramic filters for household water treatment
- experiences in Indonesia post-Tsunami

This course explores topics of water supply, sanitation, hygiene and disease in developing countries. Classes are made up of mainly lectures, group work and seminars. Active independent study is encouraged. Further, students are required to conduct research in groups of four persons to develop an environmental engineering and management programme. Results of group work are assessed through coursework and presentations.

##### **Integrated Environmental Engineering Design Project**

Grade assessment: Project work 100% (group 10%, individual 90%)

Class content:

- Unit process design
- Mass balance of flows and characteristics
- Design of hydraulic systems
- Treatment and disposal of residues
- Environmental impact assessment
- Cost analysis
- Project management

This course aims to produce comprehensive designs for waste water and toxic waste treatment. Classes are made up of lectures, tutorials, seminars, field exercises and field trips. Seminars by special lecturers on topics of design and project management are also included in class.

## **(6) Method of Academic Staff Assessment**

All evaluation of the construction, content and quality of school programmes is conducted by the Board of Studies, which is comprised of Degree Programme Directors, Module Directors and students. The role of this committee is as follows.

- ① Review, consideration and monitoring of data relating to programme performance, and evaluation of modules and programmes.
- ② Approval of amended current modules, and new modules and programmes prior to submission to the Faculty Teaching and Learning Committee.
- ③ Receiving of reports from external examining organisations and professional bodies (organisations that accredit programmes, such as CWEM), commenting and acting upon reports.
- ④ Promoting effective, innovative and efficient teaching in school programmes through the School Teaching and Learning Committee.

## **(7) Process of Curriculum Design**

Concrete content of programme curriculum is basically determined at deliberative meetings in which the school's academic staff participates. Exchange of opinion on programme content with cooperating external organisations takes place in an informal manner. This set up allows results of these consultations to be reflected on the programme via the academic staff.

## **(8) Facilities**

The following facilities are available to students:

- Computer Rooms exclusively for master's, doctoral and Stage 4 undergraduate students (two rooms)
- Independent Study Room exclusively for master's students (approximately 20 computers)
- Main Library
- Laboratories
- Student Common Rooms
- Careers Service
- Language Centre (private counselling regarding language, on-line study)
- English Language Materials Online (ELMO)
- Maths-Aid (study support for math and science)
- Writing Development Centre (holds workshops throughout the year on developing writing ability, private instruction and consultation)

## **(9) External Funding**

External funding is not applied to school administration. Administrative costs for the school are covered entirely by student tuition. Student tuition for UK and EU students is 3,950 GBP (full-time), and 2,225 GBP (part-time). Tuition for international students from outside the EU is 13,350 GBP (full-time) and 6,425 GBP (part-time). Furthermore, miscellaneous fees related to internships and scholarships are borne by the cooperating organisation.



## **(10) Method of Programme Auditing**

There are two methods of auditing by external organs. The first is the Teaching Quality Audit (TQA), which is conducted at the frequency of once every five years by the Higher Education Funding Council of England (HEFCE). The second is the National Research Assessment Exercise (RAE). This auditing is conducted once every few years on an irregular basis by the HEFCE, the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland (DEL). (Past inquiries were conducted in 1986, 1989, 1992, 1996 and 2001.) The first type of audit is an overall examination of programmes, including programme content, methods of instruction, and so forth. The second type focuses auditing on research.

## **4. Relationships with External Organisations and Communities**

The following are examples of types of cooperative relationships.

### **(1) Internships**

Internships are conducted during the three-month period following completion of coursework (period of master's dissertation preparation). Local businesses, NGOs and research institutes send requests to the university for joint research. If there is a master's student whose research topic matches, the external organisation will conduct instruction in master's dissertation preparation upon approval from the instructing professor. Also, several master's students are appointed every year to assist in research within the school.

### **(2) Scholarship Programmes**

The following are scholarship programmes that can be utilised by student of the school.

- Environmental Physical Science Research Council CTA bursaries  
Students from the UK are allotted funds for course tuition and living expenses, but students from the EU are allotted funds for tuition only.  
Reference: <http://www.epsrc.ac.uk/PostgraduateTraining/default.htm>
- School Overseas Master's Bursary  
This scholarship is targeted at international students and provides 1,500 GBP to each research department.
- Career Development Loans (maximum two years)  
Reference: <http://www.lifelonglearning.co.uk/cdl/>
- Newcastle University International Postgraduate Scholarship (NUIPS)  
A yearly amount of 1,500 GBP is paid towards tuition. In special cases with the approval of the International Scholarships Committee, the amount is increased to 3,000 GBP yearly.
- Alumni Tuition Fee Discount  
This discount gives a 10 percent reduction in tuition fees to alumni of Newcastle University who are enrolled as postgraduate students.
- International Family Discounts (IFD)  
This discount gives a 10 percent reduction in tuition fees to relatives of current international students and past international students.  
Reference: <http://www.ncl.ac.uk/postgraduate/international/finance/awards/uniawards.htm>
- British Chevening Scholarships (for international students)  
Reference: <http://www.chevening.com/scholarships>

There are two types of scholarships with differing configuration. The first is the commonly named scholarship, which provides support for tuition fees, research costs and living expenses (see above list). The second type supports organisations in hosting students for research assistance and provision of instruction in dissertations. Hosts of the latter type are local environmental consulting businesses, farming and water treatment groups, and so forth.

### **(3) Master's Dissertation Instruction**

If the needs of NGOs and businesses match with student research topics, these organisations conduct instruction and provision of information and funds useful for master's dissertation preparation.

### **(4) Special Lecturer Visits**

Efforts to bring in special lecturers to class take place actively throughout the year.

### **(5) Hosts of Fieldwork**

Fieldwork is actively carried out utilising the networks of the school. Further, there are some local businesses that pay for their own employees to undertake the master's course. In these cases, the businesses not only provide special lecturers, but conduct tours of their work sites.

### **(6) Cooperative Relationships with Other Universities**

A student exchange programme exists with the Universiti Teknologi Malaysia. Under this system, three to four students from both schools participate in master's dissertation research almost every year.

### **(7) Other**

#### **① Accreditation from Professional Bodies**

The programme is accredited by the Chartered Institution of Water and Environmental Management (CIWEM) and the Royal Institute of Chartered Surveyors (RICS). CIWEM, highly renowned internationally, is an organisation that certifies professional specialisation related to water and environmental management. The Royal Institute of Chartered Surveyors (RICS) is an advisory organ for problems related to land, assets, construction and environment. Its role is to establish, maintain and regulate standards related to these areas. Completion of the programme automatically satisfies several requirements of the CIWEM examination. Acquisition of this expert certification is an advantage in finding work in the field of civil engineering. A person with this professional certification enjoys great advantage in the job search process as well as later career advancement.

All of the school's programmes are accredited by the Joint Board of Moderators, which is comprised of the Institution of Civil Engineers (ICE), the Institution of Structural Engineers (IStructE), and the Institutions of Highways and Transportation (IHT). Completion of the school programmes leads to exemption from a portion of the training required to become a certified engineer.

## ② Institute for Research on Environment and Sustainability (2004)

An interdisciplinary research institute was established to focus on developing fundamental understanding of the processes that couple the Earth's terrestrial, oceanic and atmospheric components. In light of global climate change, the institute actively aims to contribute to the development of models and decision-making support tools for prediction and assessment. The institute was established with Newcastle University, and staff from a number of differing schools takes part in research.

## ③ Staff Student Committee

There are two Staff Student Committees in the school, one for undergraduate and one for postgraduate programmes. On the committee, staff and students discuss school facilities and structure and content of programmes. The committee meets four to five times each year and provides valuable opportunities for opinion exchange between both parties.

## ④ Tutoring System

Master's course tutors and tutors for each programme are available, and students can undergo support from tutors when necessary. Additionally, individual tutors are assigned, as the school provides student instruction extremely attentively.

# 5. Conditions for Admission

## (1) Evaluation Standards for Selection of Applicants

The following are given as requirements of admission.

- A 2<sup>nd</sup> class or above degree in the UK, or an equivalent degree
- Background in the field of science or engineering
- Clear motivation and commitment to the field of environmental engineering
- Certain standard of English language ability (See below for information on scores)

The following documents are required for application.

- Application form
- Personal statement including motivation for application
- Transcripts of grades
- Letters of recommendation
- Proof of English ability, IELTS (6.5 or above) or TOEFL (575 or above) (required of international students who are non-native English speakers)

Past grades from institutions of higher education are most heavily weighted in the selection process. While a background in civil engineering or geosciences is included in requirements for admission, it is not very heavily weighted. Future plans and motivation to undertake research are given more consideration. Consequently, students with backgrounds in a variety of fields actually enter the programme and study together. Other qualifications and experience are also given consideration.

## **(2) Considerations for Mid-career Learners**

There is no particular framework for mid-career learners; however, work experience is an advantage in admissions screening.

## **(3) Recruitment Methods for International Students**

Most recruiting is conducted through the university website. Otherwise, if there are students from universities with exchange relationships who are interested in the school's programmes, cases are handled individually.

## **6. Student Futures**

### **(1) Paths after Graduation**

Students proceed to an extremely broad range of career paths after graduation, with past cases including educational/research institutions, businesses, environmental consulting, international organisations, NGOs, and local governments. A common characteristic of students is that most utilise the knowledge, skills and research results gained in the master's programmes to gain employment in related fields. The employment rate after graduation is 95 percent.

### **(2) Methods of Network Building between Graduates**

The school maintains information on graduates and sends newsletters to alumni three times a year. Upon particular request, the school will mediate networking between current students and alumni.

The school supports students in their job searches through its career services. This service includes workshops on necessary skills for job searching, individual counselling and advice on resumes, and career forums held a few times every year. Students can receive services as necessary at no cost.

Nevertheless, instruction in career paths is often dealt with individually according to student aspirations. The school, with its strong cooperative relationships in the local industrial sector, provides opportunities for students to make connections with external organisations who could be future employers. A career forum is held once a year, and other opportunities for exchange between students and related industries are held on an irregular basis.

## 7. Summary of Research Results

Newcastle University has extremely close relationships with local society, particularly due to the fact that it became independent of Durham University due to a rising need for institutions of higher education in the community. The Graduate School of Civil Engineering and Geosciences in particular gives special consideration to collaboration with the community in all areas of programme administration, through internships, guest speakers, and opinion exchange on programme content. Through striving to strengthen relationships with local industry and government, the school is making concerted efforts to develop talent that will contribute to local society and respond to its needs.

While civil engineering and geosciences are the axial fields of study in the school, the school attempts to augment learning in harmonisation of each specialty field and the environment, interdisciplinary understanding of the environment from each field, and overall management ability.

A background in civil engineering or geosciences is not required for admission, thus students with backgrounds in diverse fields study together. Concerning the balance of UK students and international students, special attention is given to see that UK students do not become excessively few, so that UK students can provide follow-up support to non-native English speaking international students. Further, the Graduate School of Civil Engineering and Geosciences particularly encourages the application of mid-career learners, and devises the programme in various ways to accommodate them. For example, courses are offered in two types, both as the linear type, where classes meet throughout the semester, and the block type, where classes are held for a two-week period. The programme is designed to be a combination of the two. According to this system, working students can utilise leave time to undergo courses, with the potential to complete all courses in two years. While it is not applicable to the environmental engineering programme, distance learning options are available with the requirement that students visit the university periodically (Applied Hydrogeology programme and Flood Risk Management programme). Many working students utilise these means to study with aims to master concepts and augment expertise. Curriculum has science courses in water treatment and other subjects as its core, with seminar style classes, fieldwork and laboratory work included.

Issues faced by the programme include continued acquisition of excellent students, maintenance and improvement of programme quality, and managing both response to the university's bureaucratic system and programme administration. In on-site interviews conducted for this research, programme administrators were found to face difficulties in responding flexibly to present society and community needs related to the extremely dynamic environmental field. Cause was said to lie in the university's centrally-controlled bureaucratic system, which on several occasions has been an obstacle to reforms aimed at improvement of efficiency and quality of programmes.

This programme provides an attractive course to both students and society due to close cooperative relationships within the school and relationships with the local industrial sector. There are also trends to expand activities internationally, through strengthening cooperative relationships with universities in Asia and Africa.

## Appendices

### 1. List of Interview Subjects

<b>Name</b>	<b>Position</b>
Prof. Phil Blythe	Professor of Intelligent Transport Systems
Prof. Thomas Curtis	Professor of Environmental Engineering Module Leader for Environmental Risk Management Contributor to Biological Systems Engineering, Water Supply Engineering, Wastewater Engineering, Integrated Environmental Engineering Design, Environmental Engineering for Developing Countries and Dissertation Projects
Prof. Enda O'Connell	Professor of Water Resources Engineering, Director of Earth Systems Engineering
Dr. Charlotte Paterson	Environmental Engineering Programme Director
Dr. Geoff Parkin	Director of Postgraduate Studies, Senior Lecturer in Hydrology
Dr. Paul Sallis	Lecturer in Environmental Engineering
Dr. Ruth Vater	School Academic Programmes Manager
Dr. Sean Wilkinson	Senior Lecturer in Structural Engineering

### 2. List of Reference Materials

CIWEM website: <http://www.ciwem.org/about/mission.asp>, (Accessed, 24, February, 2009)

RICS website: <http://www.rics.org/>, (Accessed, 24, February, 2009)

School of Civil Engineering and Geosciences, *MSc & Diploma in Environmental Engineering Handbook 2007/2008*, Newcastle University

School of Civil Engineering and Geosciences, *MSc & Diploma in Environmental Engineering Handbook 2008/2009*, Newcastle University

School of Civil Engineering and Geosciences, *Profile 2008*, Newcastle University

School of Civil Engineering and Geosciences, *School Handbook 2008/2009*, Newcastle University

School of Civil Engineering and Geosciences, *Undergraduate Civil Engineering Handbook 2008/2009*, Newcastle University

#### **Other Materials Obtained**

Brochures of CIWEM (Provided by Dr. Charlotte Paterson)

Brochure of Institute for Research on Environment & Sustainability

Extracts from Annual Monitoring and Review Report of MSc & Postgraduate Diploma in Environmental Engineering (Provided by Dr. Charlotte Paterson)

Information Sheets of All MSc Programmes in the School of Civil Engineering and Geosciences (Provided by Prof. Thomas Curtis)

Information Leaflets of All MSc Programmes in the School of Civil Engineering and Geosciences (Provided by Dr. Geoff Parkin)

List of New Students in Environmental Engineering MSc & Diploma Programme (Provided by Dr. Charlotte Paterson)

Library Guide –Robinson Library, Walton Library, Law Library

School of Civil Engineering and Geosciences, Programme List 08/09 (Provided by Dr. Charlotte Paterson)

## **IV. University Research in China**

### **The Higher Education System of China**

There are approximately 1,900 universities in China, which are divided into four types. Types include the top research university (with the principle objective of developing advanced doctoral level talent), the partial research-oriented university (with the principle objective of developing four-year undergraduate and master's level students), the education-centred university (with the principle objective of developing four-year undergraduate students), and institutions for the development of high-level technical talent (comparable to technical schools in Japan). Postgraduate master's and doctoral courses are offered at 402 universities and 320 research institutes (Sumi, 2008). University attendance rates have dramatically increased in recent years due to a 1999 policy on expansion of higher education. Compared to 1990 figures of 6,090,000 persons enrolling in institutions of higher education, in 2005, numbers had increased eight-fold to 50,450,000 persons, an attendance rate of 21 percent (Sumi, 2008). Length of study is basically four to five years for undergraduate courses, two to three years for master's courses and three years or more for doctoral courses. As mentioned above, for master's and doctoral courses, degrees can be obtained not only from universities, but also from research centres such as the Chinese Academy of Sciences.

Universities in China have been considered institutions for training of the elite since the nation's founding. However, since the framework for recruitment of institutions of higher education was expanded in 1999, numbers of students recruited and applicants continue to increase, as higher education in China shows trends toward popularisation.

Entrance screening for university is performed by a nationwide standardised test (National High School Standardised Test). Students who wish to continue to university take the test in three subjects as well as two subjects designated by each institution of higher education (total of five subjects). Students with the best scores go on to study at universities of choice. Recommendations from universities are necessary for admittance to graduate school (in the case of undergraduates).

Graduate school curriculum is made up of common courses, specialty foundational courses and specialty courses, as well as the research thesis. Necessary credits are accumulated through taking courses.

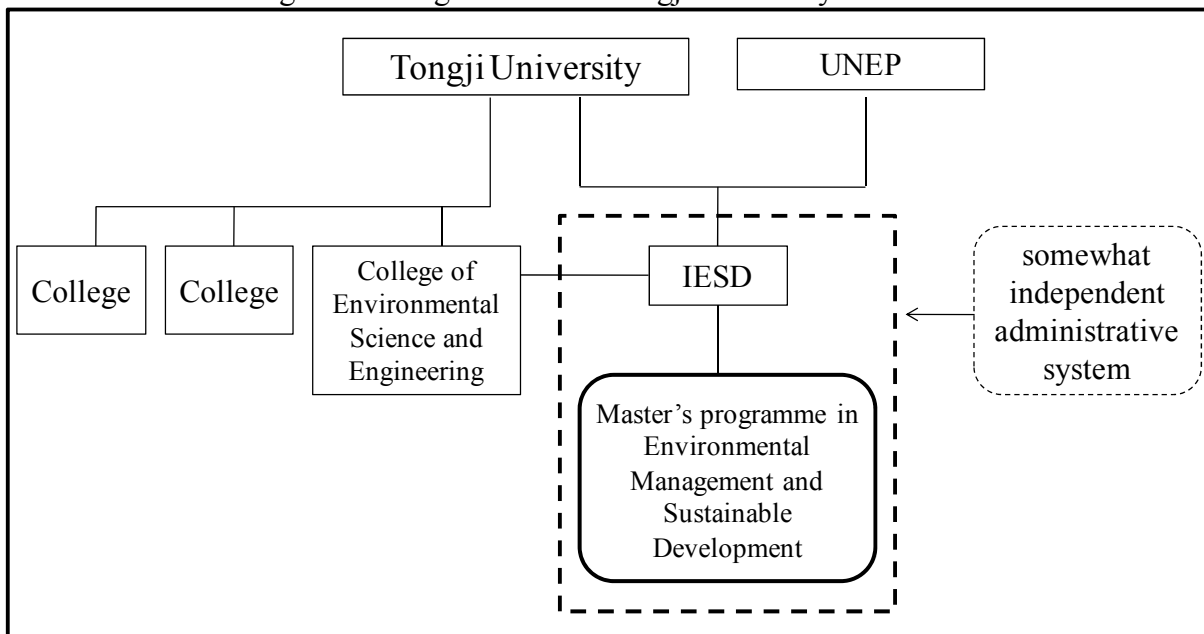
Concerning career paths after graduation, an increase in university graduates has arisen from the popularisation of higher education, resulting in a surplus of supply in relation to societal demand. Further, with intensification of market competition in recent years, increasingly businesses are attaching importance to technical skills and related work experience, resulting in increasing numbers of students unable to find work. Most students wish to work in the big cities of Beijing and Shanghai, and employment competition rates in the cities are getting higher (Sugawara, 2006).

## ■ Tongji University Institute of Environment for Sustainable Development

### 1. Outline of the Institute of Environment for Sustainable Development (IESD)

The UNEP-Tongji Institute of Environment for Sustainable Development (hereby IESD) was founded in May of 2002 per mutual agreement between UNEP and Tongji University. The Executive Director of UNEP at the time, Klaus Topfer, said that IESD is intended to be Asia and the Pacific's premier environmental teaching and learning centre.<sup>8</sup> IESD is situated on the campus of Tongji University, and its administration is supported by the Tongji University College of Environmental Science and Engineering, other related colleges and the Asia-Pacific Regional University Consortium (hereby RUC). IESD is situated as an independent college within Tongji University. It is managed by the Supervisory Board, which is comprised of high-level experts in the field of environmental protection, environmental design and environmental management from UNEP, Tongji University and others both within and outside China.

Figure 9: Organisation of Tongji University and IESD



<sup>8</sup> Higham, Tim, 2004 Top News on the Environment in Asia, [http://www.iges.or.jp/en/pub/pdf/asia2004/02\\_unep-roap.pdf](http://www.iges.or.jp/en/pub/pdf/asia2004/02_unep-roap.pdf) (accessed 22 January 2009).



## **(1) Background of IESD Establishment**

Tongji University is known as one of the top comprehensive universities under the immediate control of the government of China. In particular, it is the largest-scale university in China with top-class achievements in the field of civil engineering construction. Over the last 55 years as a State Research Centre (an institute which has a state key laboratory and is a centre for important scientific research for the country), the College of Environmental Science and Engineering has demonstrated excellent research results which are highly regarded both in China and overseas. Correspondingly, UNEP believes that the pursuit of education and research in the field of “environment for sustainable development” is one effective means of achieving a sustainable society.

In this manner, the needs of Tongji University, with its excellent achievements in education and research on the environment, and UNEP, with its desire to provide education for sustainable development to youth, were matching, leading to the joint establishment of an environmental research institute for sustainable development. The personal connections of Klaus Topfer, UNEP Executive Director at the time, were also influential in the establishment. Mr. Topfer is an honorary professor of Tongji University, and from the time of his appointment as UNEP Executive Director in 1998, he believed that China was to play an important role in the environmental field in the future. Upon UNEP’s 30<sup>th</sup> anniversary in 2002, he declared that “UNEP must make a contribution to university education,” stressing the necessity for young people to study environmental protection and sustainable development. In this manner, UNEP and Tongji University worked together, and the research institute was founded in May of 2002.

## **(2) Aims of IESD**

IESD’s vision is the establishment of an innovative educational and research foundation related to “environment for sustainable development”, based on recognition of the importance of a harmonious relationship between the three facets of sustainable development, namely society, economy and environment.

Its stated mission is, (1) to develop new educational models in the fields of environmental protection, environmental design and environmental management with the aim of conducting the most necessary research and development of managers for environmental protection in the world, particularly in developing countries, (2) to strengthen international cooperation in scientific research and scientific development, (3) to produce high-level research results to support the necessity for global environmental protection and resource conservation, as related to international policy, and (4) to become an important base for human resource development, scientific research and information exchange, both domestically and internationally.

## **(3) Basic Tenants on Education and Research**

In 2006, IESD established the International Master’s Programme in Environmental Management and Sustainable Development. This programme aims to integrate the methodologies of a variety of fields, including engineering, the natural sciences, and the social sciences, and to practice education and research on sustainable development spanning a broad range of fields, with emphasis on the relationship between society, economy and environment. Further, the programme does not consider “environment” as separated from the whole, rather places importance on comprehending “environment” from an inclusive perspective.

#### **(4) Numbers of Academic Staff and Students**

There are 20 spaces per class yearly, ten for Chinese students and ten for international students. However, student numbers are different every year, and the number of international students in particular shows sharp fluctuation. The first entering class (enrolled in September 2006) has 11 Chinese students, and three international students (Samoa, Turkmenistan, Mongolia). The second entering class (2007) has 11 Chinese students, three international students (Japan, Italy, Thailand), and two exchange students (France). Whereas the third entering class (2008) has nine Chinese students, 16 international students (Papua New Guinea, East Timor, Fiji, Mongolia, Nepal, Azerbaijan, Kenya, Sudan, Central African Republic, Liberia and Cote d'Ivoire), and four exchange students (2 from France and 2 from Germany). Of these, only three students of the first class graduated in June of 2008, because the Chinese students of the first class extended the length of the programme for a half year, and plan to graduate in March of 2009.

Most of the Chinese students continue into the course directly from undergraduate study (there are a few students with work experience), whereas most of the international students have work experience in the central and local government organs (environment-related ministries and departments) of their home countries. There are also international students with work experience in research institutions of their home countries. Students come from a wide range of undergraduate backgrounds, including environmental science, environmental engineering, agriculture, law and literature. The average age of students is in the late twenties, and the ratio of male and female students is one to one.

Table 18: Number of Enrolled Students (as of January 2009)

	Chinese students	International students	Exchange students
First class	11		
Second class	11	3	2
Third class	9	16 <sup>9</sup>	4

There are three professors, four assistant professors, six lecturers and seven guest lecturers. Further, in some cases academic staff of the College of Environmental Science and Engineering act as lecturers. There are plans to recruit for four professorial posts in 2009.

#### **2. Image of Ideal Talent (Environmental Leader Concept)**

The programme collectively considers the three elements of society, economy and environment and aims to develop leaders who will contribute to sustainable development. The qualities of an environmental leader include strong expertise, communication skills, organisational skills, systematic thinking and analytical skills, negotiating skills, and an ability to grasp matters collectively from a global perspective. The qualities demanded of the environmental leader are basically the same demanded of other leaders, but the environmental leader also requires a viewpoint focused on the environmental field and strong environmental consciousness.

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<sup>9</sup> Eight of the 16 international students are participating in an 18-month programme with no aim to obtain a degree (China Ministry of Commerce scholarship programme). Further, the China Ministry of Commerce scholarship programme was initiated in 2008.

### 3. Educational Curriculum

#### (1) Outline of Educational Curriculum

The educational curriculum for IESD is jointly designed by UNEP and the Asia-Pacific Regional University Consortium (RUC). It incorporates both an international and local perspective on sustainable development. The curriculum can be broadly divided into courses and the master's thesis research project. During the first year, students take six core course and elective courses, and during the second year conduct master's thesis research. It is possible to take courses at an overseas university (a university participating in RUC or a university with an exchange agreement) for one semester (approximately six months) out of the two years. Students are allowed to increase the period of course study or the period of the master's thesis research project based on interests or post-graduation career paths. Due to the multifarious backgrounds of students, the curriculum has a high degree of flexibility.

Table 19: Outline of the Programme

Programme	International Master's Programme in Environmental Management and Sustainable Development
Degree obtained	Master of Science
Conditions for completion	Acquisition of necessary credits
Period of study	two to three years (The programme is designed to be completed in two years, but an extension of six months is possible.)
Number of credits	30 credits

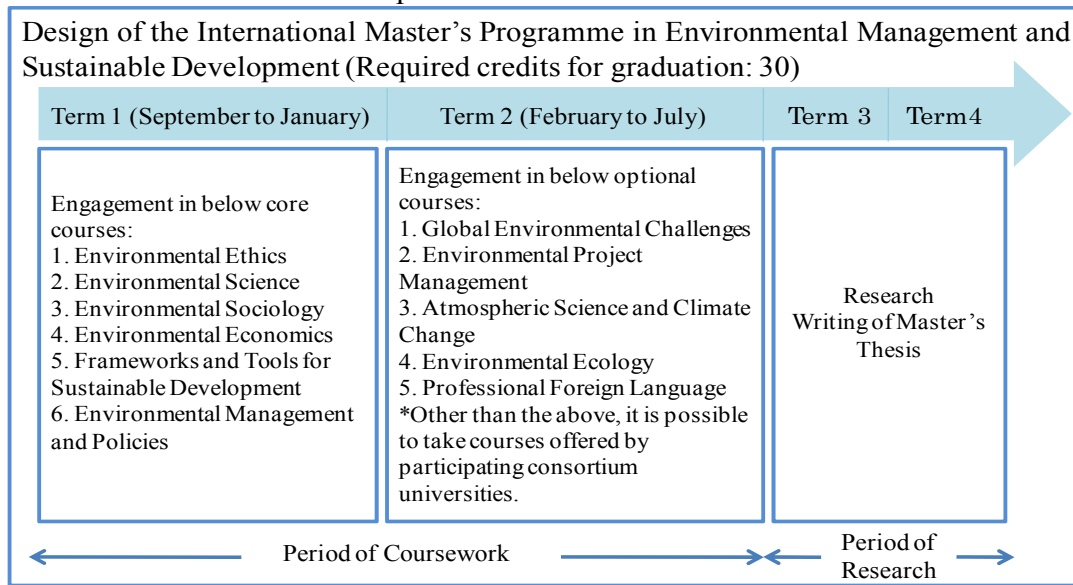
#### (2) Distinguishing Characteristics of Curriculum

The most distinguishing characteristic of the programme's curriculum is its extremely interdisciplinary construction which transverses many areas, including the new paradigm of education for sustainable development based on the three pillars of society, environment and economy. The curriculum attaches importance to problem-oriented learning, field-based learning, systematic approaches to sustainability, and interdisciplinary research. A second characteristic is the rich international flavour of the curriculum. Every student is given the chance to study at an overseas university for half a year (one semester). Further, many guest lecturers are brought in from overseas, giving students the opportunity to study a wide range of topics from diverse points of view.<sup>10</sup>

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<sup>10</sup> Guest lecturers are basically professors of RUC participating universities. If the research of the professor is related to IESD research, or if student instruction is superior, he or she takes charge of a course and lectures in some cases.

Figure 10: Design of the International Master’s Programme in Environmental Management and Sustainable Development



### (3) Course Topics

Table 20: List of Course Topics

Term	Compulsory/ Optional	Subject		Class format/Method of assessment	Number of credits
Year 1 Term 1&2	Compulsory	Language	English (for Chinese students)	lectures, etc.	3
			Chinese (for international students)		
Year 1 Term 1	Compulsory	Culture	Political Economics (for Chinese students)	lectures, etc.	3
			China Outlook (for international students)		
Year 1 Term 1	Compulsory	Environmental Ethics		lectures, presentations, discussion	2
		Environmental Science		lectures, presentations	2
		Environmental Sociology		lectures, presentations, discussion	2
		Environmental Economics		lectures, presentations, discussion	2
		Framework and Tools for Sustainable Development		lectures, group work, seminars	2
		Environmental Management and Policies		lectures, group work	2
		Social Practice		practical exercises, presentations	1
		Thesis Proposal Seminar*		seminars	1 1
Year 1 Term 2	Option	Global Environmental Challenges		lectures, presentations	2
		Environmental Project Management		lectures, presentations	2
		Atmospheric Science and Climate Change		lectures, presentations	2
		Environmental Ecology		lectures, etc.	2
		Professional Foreign Language		lectures, etc.	2
Year 2 Term 1&2	Compulsory	Research, Master’s thesis (English)			—

- Language and culture courses are common courses with other departments of Tongji University.
- Language courses are held throughout the year, with three credits given for the first and second semesters together.
- Tongji University conducts the “China Outlook” course in English for all international students, based on the following four subjects. It was set up in 2008.
  - (1) China’s Socio-Economic Development
  - (2) The Shape and Growth of the Town & Village in China
  - (3) Chinese History and Culture
  - (4) Sustainable Development in China
- The “Social Practice” course is targeted at Chinese students only. It is mainly for topic research conducted over summer vacation. (Students select a familiar environmental problem and conduct research independently, which is compiled in a report.)
- Other than the optional courses listed above, students are allowed to take courses offered by universities participating in RUC.

\*In this seminar, students select a topic on practical applications of comparative research related to environment for sustainable development, and conduct discussions on the topic and related matters. Students are usually required to attend the lecture of an internationally well-known scholar or professional, conduct discussions on the lecture, and then finally prepare a summary.

#### **(4) Distinguishing Characteristics of Educational Methodology**

Classes are mainly comprised of lectures, discussion, and presentations. Students are given a large amount of homework including preparation for presentations and reports. Instructors put special emphasis on discussion and presentations, and attach importance to active participation of students in class. Instructors often pitch questions at students and ask for their opinions. For example, in the compulsory course Environmental Ethics, the instructor made a point of presenting students with a question every ten minutes. Further, classes are interactive, and instructors will call upon students who do not actively speak up in class to encourage their participation. Most instructors are of the mind that students master interpersonal skills in class through presentations and discussion.

In the early stages of the programme, a training course is held to learn research methods and leadership skills. This short-term course (two to three days) is conducted by two instructors, one from IESD and one from a RUC participant university. A great amount of group discussion is included, and students are given the opportunity to contemplate individually and exchange opinion on the necessary qualities of a leader.

## **(5) Method of Course Assessment**

Although methods of course assessment depend on instructors, most courses are assessed by presentations and term report. Each course requires tasks, and these assessments are also considered. Students are generally assessed by 40% of term report, 30% of presentations, 30% of tasks. In addition, students' participation to classes is emphasized, so attitude in classes are also considered.

### **Example**

#### **Environmental Ethics**

Assessment: Individual mid-term presentations (10%), final term report (25%), final term presentation based on report (individual) (15%), Class discussion (30%), homework (15%), attendance (5%)

Course content:

#### I. Introduction

#### II. Harmonisation and Sustainability

- The Human Being and Nature
- Harmonisation of the Mind, Body and Soul
- The Wants and Needs of Human Beings
- Human Beings and Issues of Sustainability

#### III. Ethics and Sustainability

- Overview of Environmental Ethics

#### IV. Environmental Ethics—Animals, Plants, Ecosystems

- Environment of Animals and Plants
- Ethics of Respect for Nature
- Moral Consideration for Nature and Ecology

#### V. Intrinsic Value of Nature

- The Varieties of Intrinsic Value
- Value in Nature and the Nature of Value
- Environmental Ethics and Weak Anthropocentrism

#### VI. Environmental Ethics—Monism versus Pluralism

- Moral Pluralism and the Course of Environmental Ethics
- The Case for Practical Pluralism

#### VII. Reframing Environmental Ethics

- Deep Ecology: a New Philosophy of Our Time
- Ecological Feminism and Ecosystem Ecology
- Pragmatism in Environmental Ethics: Democracy, Pluralism and the Management of Nature

Classes contain a lecture by the instructor, followed by 20 to 30 minutes of discussion (small group discussion) on a selected case study related to the lecture topic. Individual final term presentations are conducted in the last class, with students also participating in assessment. This system was adopted from 2008, in which instructor evaluation of the final presentation is 50 percent, and student evaluation is also 50 percent of assessment.

## **Environmental Science**

Assessment: Presentation (30%), Final term report (40%), homework (30%)

Course content:

- I. Introduction—Environmental Interrelationships
  - The Interrelated Nature of Environmental Problems
  - Environmental Ethics
  - Risk and Cost: Elements of Decision Making
- II. Ecological Principles and Their Applications
  - Matter, Energy and Environment
  - Environment and Organisms
  - Ecosystems and Communities
  - Human Population Issues
- III. Energy
  - Energy and Civilisation
  - Nuclear Energy: Benefits and Risks
- IV. Human Influences on Ecosystems
  - Land-Use Planning
  - Soil and Its Uses
  - Agricultural Methods and Pest Management
- V. Pollutions and Policies
  - Air Quality Issues
  - Solid Waste Management and Disposal
  - Regulating Hazardous Materials
  - Environmental Policy and Decision Making

## **Environmental Management and Policies**

Assessment: Essays (30%), group activities (30%), 5,000-word report (40%)

Course content:

- I. Introduction
  - Role of Institutions in Sustainable Development
  - Policy Making Process
- II. Governance and Legal Issues
  - National Governance
  - Role of Ministries and Departments
  - National versus Local Governance
- III. Global Environmental Governance
  - International Environmental Diplomacy
  - Multilateral Environmental Institutions
- IV. International Environmental Law
  - Concept and Historical Perspective
  - Roles and Functions of International Environmental Law
- V. Case Studies on Selected MEAs
  - Convention on Biological Diversity and its Biosafety Protocol
  - UN Convention on Climate Change
  - Rotterdam Convention on Chemicals

## **Environmental Sociology**

Assessment: Mid-term examination (30%), assignments and presentations (30%), Final examination (40%) Presentation topic: Rural development programmes in the student's country.

Course content:

### I. Growth and Development

- Development Theories
- Development and Disparities: Income, Rural-Urban and Regional

### II. Expectations and Achievements in Development Planning

- Failure to Achieve Structural Transformation of the Economy
- Continuing Predominance of the Rural Sector

### III. Poverty Analysis and Poverty Alleviation

- Definition and Measurement
- Poverty Eradication Strategies and Management: Microfinance and Sustainable Livelihood Approach
- Experience of Poverty Alleviation Programmes and Policies in Asia

### IV. Changing Approaches to Rural Development

- The Sectoral Approaches: Agricultural Development and Land Reform, Development of Rural Infrastructure, Integrated Rural Development
- Decentralisation and Participation: Top-down and Bottom-up Planning

### V. International Development Cooperation

- The Role of AID in Development
- The Role of Donors in Development

### VI. The Non-state Actors in Development

- NGOs, Civil Society and New Social Movement

### VII. The Spatial Framework for Development

- Location Theories
- Rural-regional Development



## **Environmental Economics**

Assessment: Examinations, Assignments, Presentations

Course Content:

- I. Economics of Sustainable Development
  - Growth, Sustainability Stability, Equity and Efficiency
  - Poverty, Inequality, Conflict, Environmental Degradation, Biodiversity
  - Economic Development and Sustainability
- II. Overview of Circular Economy
  - Law and Policies
  - Circular Society
- III. Economics of Circular Economy
  - Micro-Macro Economics
  - Social and Economic Implications
- IV. Concepts of Circular Economy
  - The Cradle-to-Cradle Concept
  - 3Rs or 5Rs Approach
  - Life Cycle Approach
  - Cleaner Production
  - Product Design and Manufacture
  - Product Use and Discard
- V. Mass Circulation in Natural Eco-systems
  - Food Chain in Water Eco-system
  - Principles of Circular Economy
  - Mass Flows and Circularity in Industrial Processes
  - Mass Flows in Industrial Systems—Example Cases
- VI. Industrial Symbiosis
  - Case Studies
- VII. The Need for Circular Economy
  - Major Environmental and Social Issues that Affect Economic Systems
  - Change in Policies in Some Countries
  - Valuing Resources in a Circular Economic System

## **Frameworks and Tools for Sustainable Development**

Assessment: Assignments (Assignment 1: In groups, students will create virtual companies, designing company strategy based on lecture content, and will present content in groups. Assignment 2: Based on lecture content, students will write a 5,000 word essay on the topic of sustainable production and consumption.)

Course content:

### I. Organisation Level of Instruments and Frameworks

#### 1. Preventative Approaches, CP, PP, CP Assessments

- Process, Aspects and Impacts
- 2. Environmental Management Systems (EMS)
  - Environmental Policy
  - EMS, EMS Standards
- 3. Measurement and Reporting
  - Performance Indicators, Reporting

### II. Sustainable Production and Consumption

#### 1. Consumption and Production

- Life Cycle Approach
- Eco-efficiency
- Ecological Footprint
- 2. Product Design
- 3. Products and Services
  - Environmental and Sustainable Procurement
  - EPR

### III. Managing Supply Chains

- Standards of Performance
- CSR

### IV. Regional Level Instruments

- Input-output Models
- Industrial Ecology
- Urban Ecology

### V. Environmental Assessment, Planning and Management

- Environmental Impact Assessment, Environmental Planning
- Ecological Impact Assessment and Natural Resource Protection Planning
- Strategic Environmental Assessment

## **(6) Method of Academic Staff Assessment**

Students assess instructors per an evaluation form passed out at the final session of class. If a number of instructors are in charge of one course, evaluation is conducted for all instructors. Evaluation forms are submitted to each instructor, and class improvements are made taking student evaluations into consideration.

## **(7) Process of Curriculum Design**

Curriculum was jointly developed by UNEP and RUC participant universities. It aims for students to augment an inclusive understanding of the current and past situations of global-scale development, to foster critical thinking ability, and to master the ability to utilise new cutting-edge approaches and tools for environmental protection and sustainable development. The basis for curriculum design is the curriculum of the Leadership Training Programme held jointly by IESD and UNEP since 2004. This programme focuses content on the four facets of sustainable development (society, environment, economy and humanity), and on integration of these four facets.

The master's programme curriculum was developed upon this content, combined with the necessary social science courses to support understanding of sustainable development. These include "Environmental Ethics", "Environmental Sociology", "Environmental Economics", "Frameworks and Tools for Sustainable Development", and "Environmental Management and Policies". In this manner, curriculum was designed with a base in the three elements of society, environment and economy, while covering a broad range of fields.

The process of curriculum design required adherence to the regulations of a variety of related organisations, including the government of China (Ministry of Education), Tongji University and the College of Environmental Science and Engineering. Thus, a two-year preparatory period was required. Mr. Surendra Shrestha (former UNEP-ROAP Director, current Director for Strategic Resource Mobilisation and Special Initiatives at UNEP Headquarters) was instrumental in curriculum design.

For development of core courses, the person in charge of each course (IESD academic staff appointed at UNEP/RUC meetings) reviewed course outlines determined by discussions between UNEP and RUC, and prepared an outline of the course (noting content, texts, references, and assessment methods). RUC academic staff confirmed these outlines, correcting and supplementing, whereby the course content was finalised. Professor Mario T. Tabucanon (present IESD Senior Advisor) of Thailand's Asian Institute of Technology, was instrumental in the process of course development. Further, the courses to be taught by RUC academic staff were determined based on discussions with RUC.

At the end of each semester, all members of the IESD academic staff conduct feedback on each course, and conduct a meeting where points for improvement are discussed.

## **(8) Facilities**

The university is equipped with libraries, cafeterias, computer labs, teleconference rooms, a hospital, laboratories, research rooms, etc., and students can make use of almost all facilities. A student card is given to each enrolled student, and this card is shown when using facilities. Use of all libraries (university library and libraries of colleges) at Tongji University is possible, and a variety of databases can be accessed from the library website. The research offices of academic instructors can be used freely (lab facilities are available based on the instructor's research field). In addition, the research offices of each college are available. Further, there are computers for student use within IESD, which are equipped with Internet access.

## (9) External Funding

IESD receives funding support in the form of scholarships from the Government of China (Ministry of Education, Ministry of Science and Technology and Ministry of Commerce), and from the People's Government of Shanghai. Funding support for research as well as donations is also received from industries.

In 2006, IESD was provided three million CNY based on the government's Project 985, and at the time enjoyed favourable financial conditions.<sup>11</sup>

Main administrative funds for the master's programme come from international student tuition (scholarships). Chinese student tuition is funded by Tongji University. However, programme administration based solely on scholarship income is currently proving difficult, and requests are being made to the People's Government of Shanghai, the Ministry of Education and related ministries and departments, for further funding support (increase in scholarships). On the other hand, conditions for funding of research projects by the government of China and the People's Government of Shanghai are favourable. Use of these funds is flexible, thus surplus funds for research projects are applied where funds are lacking in master's programme administration.

The IESD Business Plan (2006-2010) drawn up in November of 2005 gave the following revenue projections (for IESD overall).

Table 21: Revenue Projections (in US Dollars)

	2006	2007	2008	2009	2010
Tuition*	31,250	93,750	140,625	195,313	257,813
Fees**	180,000	300,000	300,000	360,000	360,000
Sponsored Projects***	625,000	625,000	625,000	625,000	625,000
Secondment****	—	20,000	20,000	20,000	20,000
Sub-total	836,250	1,038,750	1,085,625	1,200,313	1,262,813
Donations*****					
—Tongji Univ.	180,000	180,000	180,000	180,000	180,000
—UNEP	100,000	100,000	100,000	100,000	100,000
—Bayer	250,000	250,000	250,000	250,000	250,000
—Others	25,000	25,000	25,000	25,000	25,000
Sub-total	555,000	555,000	555,000	555,000	555,000
Grand total	1,391,250	1,593,750	1,640,625	1,255,313	1,817,813

<sup>11</sup> Project 985 is a key policy of the Ministry of Education for establishment of world-class universities. On 4 May 1998, at the 100<sup>th</sup> anniversary of the founding of Beijing University, Chinese President Jiang Zemin declared that, "China must have a number of first-rate universities of international advanced level". In response, under the Project 985, part of a plan to promote education for the 21<sup>st</sup> century, the Ministry of Education began to support a number of focal universities that aim to become top-class high-level universities in the world. Project 985 was so named because of the date of the declaration in the year 1998 and the fifth month of May.

\*As of November 2005, tuition for 20 persons was calculated (Chinese students: 1,250 USD yearly, international students: 5,000 USD yearly). Current tuition is the same. The first semester of studies begins in September, thus for 2006, only one semester of tuition was calculated.

\*\*Participation fees were paid by participants in the Leadership Programme (2,000 USD per person). These funds were used for administration of the same programme.

\*\*\*As it is not possible to estimate research project revenue, this is merely expected figures. It was recognised that in order to maintain quality of research, a yearly sum income of 625,000 USD in research funding was ideal.

\*\*\*\*Amount paid by sending institution when experts from other institutions are seconded to IESD. The individual sent to IESD participates in IESD activities, but receives salary from the sending institution.

\*\*\*\*\*Donations from Tongji University are continued for five years (2006-2010). Donations from UNEP, Bayer, and others (Ministry of Commerce, Ministry of Education) are continued for two years. Therefore, donation figures for 2008 and on are expected figures. Donations from Bayer are directed only at a specific research project.

#### **(10) Method of Programme Auditing**

IESD activities overall are deliberated on the IESD Supervisory Board, but there is no particular audit of the master's programme alone. Adjustment and review of curriculum is acknowledged to be highly important and necessary, but has yet to be implemented. There are plans to carry out deliberations on adjustment of course content (to discover overlapping areas) among the persons in charge of the six core courses.

### **4. Relationships with External Organisations and Communities**

#### **(1) Relationship with UNEP**

Two factors in the background of the relationship with UNEP are the top-level status of Tongji University in China, as well as the personal connections with Tongji University of a former UNEP Executive Director. Tongji University was chosen to partner with UNEP due to it being one of the few institutions conducting education and research in the field of the environment, and to the university's efforts to strengthen its focus on environmental fields. IESD academic staff is of the view that the potential for other universities to develop this kind of relationship with UNEP is low. The reason being that IESD activities have gotten off to a good start, thus there is no necessity for UNEP to make agreements with other universities.

UNEP support for the master's programme was mainly limited to the preparatory period, and there has been little support (administrative funding support, etc.) following establishment of the programme. During the preparatory period for programme establishment, UNEP made a contribution to the founding of the programme through provision of a variety of proposals and advice on programme outline, curriculum and course development.

**(2) Relationships with the Regional University Consortium**

The RUC is made up of universities that participated in a 2003 workshop, which was held based on proposals from UNEP. Participating universities are listed below. RUC was established with the aim of promoting sustainable development through education. Its establishment was spurred when, during the workshop, the Vice Chancellor of Griffith University at the time strongly declared the necessity for a university consortium aimed at promotion of education for sustainable development. The consortium is supported by the Regional Office for Asia and the Pacific (ROAP) of UNEP, and currently has its office located at IESD. Consortium universities have contributed to the development of IESD by providing advice and support for IESD master’s programme curriculum development, as well as IESD education and research projects. There is no membership fee, but transportation costs, etc. for participation in the yearly meeting are borne by each member.

Table 22: Member Universities of the Asia-Pacific Regional University Consortium

University	Country
Asian Institute of Technology	Thailand
Griffith University	Australia
Nanyang Technological University	Singapore
Tongji University	China
University of New South Wales	Australia
University of Wollongong	Australia
Yale University	USA
The United Nations University	Japan

**(3) Relationships with Industry**

An example of a cooperative relationship with industry is the cooperation in educational and research activities with Bayer AG (headquartered in Germany). Bayer AG has provided IESD continual funding support since the programme’s establishment, and has built a close relationship with IESD. The particulars of the relationship from the educational side include the donation of a forum by Bayer AG, held on 15 October 2007. The title of the forum was “Environmental Policy and Sustainable Development”, and a sum of one million USD was donated over a period of five years from the Bayer Science and Education Foundation. Through this forum, support was provided for high-level education and research to produce environmental technologies. Further, this cooperative relationship aims to lead to discovery of solutions for China to issues of environment, economy and sustainability through active support for projects related to sustainable development. Academic research is also expected to contribute to formation of public policy on sustainable environment in China into statutes.

Bayer AG asserts that science is valuable as it contributes to the development of sustainable solutions to societal problems. As a business with a basis in research, Bayer places great importance on support of scientific fields. In charge of the forum donation is Dr. Wolfgang Plishke, member of the Board of Management of Bayer AG, who has been teaching at the school since January of 2008. IESD expects Dr. Plishke to contribute to strengthening of IESD educational and research activities, as well as direction and supervision of the Bayer-supported research project. In 2006, Bayer AG also donated a forum on “Intellectual Property Rights” at the Sino-German College of Applied Science of Tongji University, making the IESD forum the second to be donated to Tongji University.

In addition to the donated forum, a scholarship programme is provided to support tuition for students who study at overseas universities.

In the background of the forum donation to IESD is Bayer AG's existing relationship with UNEP to support the activities of youth, and the fact that the needs of IESD matched with Bayer's social service activities, in particular service activities for sustainable development.<sup>12</sup>

Funding support for research projects is received from HSBC, but not funding support on the education side. A large-scale research project called the Hong Kong Freshwater Supply Project is being carried out per funding support from HSBC.

#### **(4) Other Cooperative Relationships**

Joint research is conducted with numerous overseas universities, particularly in Europe. The predecessor to Tongji University was a school of medicine founded by a German, thus relationships with Germany are particularly strong.

IESD conducts an exchange student programme with Venice International University in Italy. In the background of this relationship is Tongji University's previous relationship with the Sino-Italian College in Italy. In 2004, the Vice Dean of IESD, Professor Li, was instrumental in starting up deliberations on cooperation with IESD for a student exchange programme. As the Sino-Italian College did not offer a master's level course, the exchange student programme with Venice International University was implemented. The Italian government provides support for tuition and housing expenses of students participating in the exchange programme. Eight IESD Chinese students yearly participate in student exchange to Venice International University.

Other relationships include a relationship with the government of France. This relationship is related to links constructed by the Chinese Ministry of Science and Technology, and both the government of France and the Chinese government provide funding support for research projects. An example of a project is the Chongming Region Water Resource Management Project.

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<sup>12</sup> Bayer AG is one of the first companies worldwide to have a long-term relationship with UNEP in the field of youth and environment. Bayer's cooperation with UNEP began in the late 1990s with a project on youth and the environment in Asia. In the summer of 2004, Bayer and UNEP formed an agreement to expand cooperative activities to a global level. Since, Bayer has provided support for the development of a youth network in the regions of Asia, Latin America and the Caribbean, and for Global Environment Summits held once every two years for over 200 participants. Additionally, Bayer and UNEP have organised numerous joint research projects for youth worldwide. In addition to this cooperation, Bayer supports joint projects through the donation of one million EUR every year.

## **5. Conditions for Admission**

### **(1) Evaluation Standards for Selection of Applicants**

Two types of evaluation are conducted in admissions selection, screening for admission and screening for scholarships. First admissions screening is conducted, then successful applicants are screened for scholarships. Applicants who do not ask for scholarships undergo admissions screening only.

The following documents are required for admissions applications.

- ① application form
- ② academic transcripts for a bachelor's degree (or equivalent)
- ③ English ability test scores (550 or above on the TOEFL, or 6 or above on the IELTS)
- ④ National Entrance Examination for Master's Degree Study (Chinese students only)
- ⑤ Medical Health Certificate

Those exempt from the National Entrance Examination for Master's Degree Study require letters of recommendation from university.

Admissions screening is conducted by a committee of faculty appointed by the Dean of IESD. The faculty committee may include members of RUC. The committee assesses applications based on the four following screening criteria.

- ① Standard and reputation of the university or institution where the applicant obtained his/her undergraduate degree (or master's degree);
- ② The applicant's cumulative and final-year grade point averages;
- ③ The applicant's English language proficiency (oral and written);
- ④ Professional experience (some years of experience will be advantageous).

Applicants who pass admissions screening then undergo screening for scholarships. This screening is conducted by a scholarship committee made up of faculty and representatives of scholarship sponsors, appointed by the Dean of IESD.

The Scholarship committee evaluates student applications based on the following selection criteria.

- ① Academic achievements;
- ② Career plans after completion of master's programme;
- ③ Any other criteria stipulated by the scholarship donor (e.g. career path after graduation, gender, nationality, and so on).

Those applicants who pass the above two screening processes are qualified for admission.

### **(2) Considerations for Mid-career Learners**

Professional experience in a related field is an advantage in the selection process. Further, master's degrees in related fields are also given consideration.



### **(3) Standards for Selection of International Students**

International students are required to have the English language ability to take courses and pursue research in English. Chinese language ability is not a standard of evaluation.

### **(4) Recruitment Methods for International Students**

Other than recruitment on the IESD website, informational pamphlets are sent to top universities in the Asia-Pacific region, and universities of other regions with strong connections in the Asia-Pacific region. Furthermore, because the Leadership Training Programme is well-known internationally, many students learn of the master's programme via the training.

## **6. Student Futures**

### **(1) Paths after Graduation**

As of January 2009, there are only three international student graduates from the first class. The career paths of these students are United Nations organ employee (one Samoan student), and returning to work at government organs in home country (one Mongolian student and one Turkmenistan student). Chinese students of the first class plan to graduate in March of 2009. Most students aim to find employment in Shanghai (government organisations, businesses).

A few students from the first, second and third classes were questioned on their career aspirations. Replies included returning to work in home countries (one international student), continuing education in doctoral course (one international student, one Chinese student), obtaining employment in a governmental organ (one Chinese student), and obtaining employment at businesses (four Chinese students). A common trait in the aspirations of students who plan to find work after graduation is the desire to find a workplace and position in which they can make the most of their IESD educations. However, employment in business specific to the field of environmental management is apparently difficult in China, and employment conditions for 2009 are expected to be harsh, particularly due to influence of the financial crisis of late. Employment conditions in the fields of environmental science and environmental engineering are comparatively good.

As IESD aims to develop leaders active in international and government organisations (in environmental protection and resource related departments), it expects students to find employment in these types of organisations. Many international students have professional experience in ministries in charge of environmental protection in their home countries, thus intend to make the most of that learned at IESD in their home countries following graduation.

### **(2) Methods of Network Building between Graduates**

A network has been formed, but as graduates are still very few as of January 2009, the network is very small. At present, it is limited to information exchange over the Internet.

## **7. Future Issues**

### **(1) Issues of Programme Administration**

One major issue is securing of administrative funding for the programme and stabilisation. Administrative funding relies mainly on international student tuition and surplus funds from IESD research projects. As numbers of international students vary year by year, the amount of funds are not stable. Further, as professors are brought in from universities participating in RUC, costs are high compared to regular programmes conducted in Chinese. (Payment of transportation and living expenses is required, and salaries are high compared to Chinese professors.) In 2008, a televised lecture by a United Nations University professor was conducted, but student response was not evident. Televised lectures were found to be difficult, in that face-to-face lectures are more meaningful. Students also want face-to-face lectures. However, as funds are limited, at present only a few external instructors are invited. Due to these financial issues, academic staff is making continued efforts to obtain further external funding. A related issue is lack of sufficient staff, not only staff in charge of courses, but also required are staff persons experienced in programme administration. In order to address shortages of staff, four new professorial posts will be filled (as of January 2009).

On the other hand, international recognition for IESD is on the rise due to the value of the UNEP name, and many professors feel pressured. In order to not stand on the name alone, staff is keenly aware of the need for even greater efforts toward programme improvement.

Further, the importance of conducting policy advisement targeted at the Chinese government and local governments (the People's Government of Shanghai) in the environmental field is recognised.

### **(2) Issues Related to Programme Content**

There is a necessity to include new environmental issues in the curriculum to address the ever-changing state of affairs in global society. Particularly in relation to environmental management, the maintenance of cutting-edge outstanding course standards is a serious issue. Courses on environmental information systems, geographical information systems and mathematical models should be included in curriculum (courses are already set up in Chinese), but present conditions make establishment of these courses in English difficult.

Improvement of the quality of course content of the courses of IESD academic staff is also an issue. IESD academic staff belong to the College of Environmental Science and Engineering, thus in most cases are specialists in the field of environmental science and environmental technology. On the other hand, academic staff with specialties in social science fields are few, resulting in the need for improvement of the quality of course content for social science courses.

Further, students come from a wide variety of academic backgrounds. Thus, another issue is the trend that course content tends to be limited to general matters.

### **(3) Issues Related to Academic Staff**

Improvement of the abilities of academic staff is another major issue. There are few instructors who speak English fluently, and many instructors find teaching classes in English to be difficult. Among older professors, there are those who speak only Chinese and thus cannot communicate with international students. For this reason, instructors are brought in from RUC universities, and experts are invited from other colleges of Tongji University as well as from institutions both in China and abroad. However, as mentioned above, high costs limit numbers. In some cases, young researchers (Ph.D.) are invited.

Tongji University offers training in teaching method improvement for academic staff, as well as an exchange programme for Tongji University instructors aimed at improvement of English and teaching ability. The programme is conducted for a period of three to four months, and expenses are borne by Tongji University. Currently, one assistant professor of IESD is studying in Australia. In particular, inexperienced young academic staff that begins teaching immediately following completion of doctoral courses can utilise this programme to improve skills. In 2009, plans exist to send one IESD assistant professor to the USA.

### **(4) Issues Related to Teaching Materials**

Currently, texts utilised are those published in English-speaking countries, which are copied and republished by Chinese publishing companies. China recognises this to be legal. The majority of texts used at IESD are published by Tsinghua Press. In 2009, 50,000 CNY of assistance was received from Tongji University for preparation of textbooks, and preparation of texts is planned based on these funds. Up-to-date data on China is to be included in these textbooks.

### **(5) Issues Related to Relationships with External Organisations**

Relationships between China and Japan, as well as China and the USA, are few compared to relationships with EU countries. IESD has a strong will to pursue relationships with Japan and the USA. In particular, promotion of relationships with Japanese international organisations and universities is being considered, due to the existence of superior environmental protection policy in Japan. Plans are being made to discuss relationships with US universities at an international conference to be held at a US university in November of 2009. IESD plans to encourage Stanford University, UC Berkeley and the State University of New York to participate in this conference. US universities also would like to cooperate in the field of research, such as in joint research programmes.

### **(6) Other Issues**

Another issue is improvement in research instruction for international students. Among international students, there are those that get involved in the research projects of instructors in order to write their master's theses. However, the majority of research projects are carried out in Chinese, making it currently difficult for international students to participate. Further, while Chinese students can make contributions to these research projects, there are instructors who find provision of instruction to international students to be a burden. On the other hand, there are international students who feel unsatisfied that they cannot participate in research projects. Additionally, international students cannot read literature and data written in Chinese, thus cannot conduct comparative research on China and their home countries, putting a greater burden on responsible academic staff. In order to improve the situation, the establishment of a special allowance for instructors engaged in international student instruction is being considered.

## **8. Other**

### **(1) Internships**

The academic staff of IESD considers internships at international organisations and research institutes to be highly important to student careers. Every year, internships at UNEP offices (Nairobi, Bangkok) and other international organisations and research institutes are strongly encouraged. However, competition for internships at such international organisations is very intense, and only a few persons can actually participate. IESD actively provides information to students, including informing students of internship opportunities on its website. While mediation with host institutions is not conducted, consideration is given in the form of credits approved for internship experience.

### **(2) Scholarship Programmes**

Almost all IESD students utilise scholarship schemes. Yearly tuition for IESD Chinese students is 10,000 CNY (approximately 1,424 USD or 126,000 JPY), and housing (university dormitories) and living expenses total 1,844 USD. Yearly tuition for international students is 39,000 CNY (approximately 5,700 USD or 506,000 JPY), and housing and living expenses total 2,232 USD. Separately, approximately 683 USD are necessary for programme expenses such as textbook purchase. Further, courses or research undertaken at RUC universities is not included in the above tuition, and requires tuition of 6,000 to 7,000 USD per semester (tuition amounts depend on the university). For this reason, the majority of students who pursue studies at RUC universities utilise scholarships provided by Bayer AG and the UNEP Topfer Foundation. At present, only one self-supported student has participated in the exchange. Scholarships pay for only tuition, thus students must bear the cost of living expenses themselves.

Scholarships for international students are as follows.

- Chinese Government Scholarship
- Shanghai Government Scholarship
- Scholarship from the Ministry of Commerce of China
- Scholarships from international organisations (UNEP Topfer Foundation)
- Other scholarships (Bayer AG)

Chinese Government Scholarships are offered by the Ministry of Education of China. The Chinese Government Scholarships and Shanghai Government Scholarships are official scholarships administered by Tongji University. Government scholarships include exemption from tuition, housing expenses, educational materials, and medical costs, and a monthly sum is paid for living expenses. Scholarship recipients undergo yearly evaluation (evaluation of student grades) based on scholarship by-laws, and only those certified can continue to receive scholarships the following year. Ministry of Commerce scholarships were initiated in 2008 and are targeted at students from developing countries in Asia, the South Pacific, and the Caribbean. Scholarships from international organisations and other scholarships are administered by IESD. Many other scholarships exist for Chinese students, as well as work in research assistance and IESD office assistant positions within the school. Scholarships for international students are limited.

International students have received the following scholarships to date.

First class: 3 students, funding support from UNEP

Second class: 3 students, privately funded exchange programme participation

Third class: 16 students, Chinese Government and Shanghai Government scholarships (8) and Ministry of Commerce scholarships (8).

### **(3) Language**

Chinese students are required to take courses in English, and international students are required to take courses in Chinese.

### **(4) Leadership Programme**

IESD has been holding the Asia-Pacific Leadership Programme on Environment for Sustainable Development since 2004. This one-week programme is targeted at leaders of organisations and has been held five times with over 150 participants from the Asia-Pacific region. The programme is held with support from UNEP and RUC, and also received funding support from businesses and local government. The programme focuses on three dimensions (the human dimension, the environmental dimension and the sustainable development dimension) and is made up of lectures from experts of IESD, consortium universities and other institutions, group work and sessions among participants, and field trips.

Each time about 20 student volunteers participate in the preparation and administration of the programme. Further, two excellent student volunteers are sent to the UNEP Bangkok office to prepare for the programme (2 weeks to one month). Members of the academic staff consider this volunteer activity to be training for students in leadership skills.

In addition to the Asia-Pacific Leadership Programme, the following programmes are also held with the support of international organisations and industry.

- Young Environmental Leaders Programme (held yearly between 2007 and 2011), funded jointly by the Ministry of Science and Technology of China and UNEP
- IESD-HSBC Leadership Programme (held twice yearly since 2006), funded by HSBC

## **9. Summary of Research**

The IESD master's programme, conducted in English and organised around the topic of "education for sustainable development", is the only master's level programme in China that devises to develop environmental leaders. It is likely that curriculum design and programme administration in the comparatively new and yet-to-be fully established academic field of sustainable development are not easy tasks. Implementation of the programme after the two-year preparation period was due to the concerted efforts of IESD academic staff and in large part to the support of UNEP and RUC. IESD academic staff members have stated that the practical advice of professors from RUC universities was extremely beneficial for curriculum and course development in particular.

The programme integrates a balance between the three facets of society, economy and environment, and aims to develop leaders to contribute to sustainable development. Further, the qualities of the environmental leader are seen to be strong expertise, communication skills, organisational skills, systematic thinking and analytical ability, negotiating skills and the ability to grasp matters collectively from a global perspective. IESD aims to develop this kind of talent through integration of the methodologies of a variety of academic fields, including engineering, the natural sciences and the social sciences. While focusing on the relationships of the three facets of society, economy and environment, it practices education spanning a broad range of fields related to sustainable development. In particular, importance is attached to grasping matters related to the environment from an inclusive perspective.

Curriculum is divided into coursework and the master's thesis research project. Six core courses and optional courses are taken during the first year, and master's thesis research is conducted during the second year. It is possible to spend one semester (approximately six months) out of the two years taking courses or conducting research at an overseas university (RUC participant universities or universities with exchange agreements).

A distinguishing characteristic of this programme is its interdisciplinary curriculum that covers a broad range of areas, with some courses taught by RUC university instructors. Further, special lectures of experts from overseas universities or international organisations are held. One explanation for this system is the fact that most IESD instructors are experts in environmental science and engineering, thus there is a lack of instructors in social science fields. Another explanation is difficulty in conducting courses in English.

Classes contain lectures designed to instil knowledge and concepts on sustainable development, and presentations, discussion and group work are also included. Active student participation is highly valued. Further, students master interpersonal skills through class presentations and discussion. Participation in internships at international organisations is encouraged, but as spots are limited, only a few students can actually participate.

As of January of 2009, there are 31 Chinese students, 19 international students and 6 exchange students enrolled in the programme. There have only been three graduates of the first class thus far, and 11 Chinese students plan to graduate in March of 2009. Regarding career paths after graduation, most Chinese students find work in domestic industry. As most international students are mid-career learners, they plan to return to workplaces in their home countries (mainly government organisations) after graduation. IESD aims to send graduates to international organisations and government organs.

At present, two and a half years after programme establishment, IESD academic staff conducts courses by trial-and-error while utilising advice from RUC university instructors and feedback from students. Future issues include stabilisation of programme administrative funds, improvement of teaching abilities of instructors, and improvement of research instruction for international students. Improvement of teaching ability of instructors is indispensable, in particular the improvement of practical English skills, teaching methods and expertise.

Future improvements in IESD's administrative base, the overall programme, and particularly the quality of education and research in the social science fields, are expected.

## Appendices

### 1. List of Interview Subjects

Dr. Ru GUO	Lecturer, UNEP-Tongji Institute of Environment for Sustainable Development
Dr. Niu Dongjie	Associate Professor, UNEP-Tongji Institute of Environment for Sustainable Development
Prof. Dahe JIANG	Director of General Office, UNEP-Tongji Institute of Environment for Sustainable Development
Prof. Fengting LI	Associate Dean, UNEP-Tongji Institute of Environment for Sustainable Development

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## **V. University Research in Thailand**

### **The Higher Education System of Thailand**

As of 2003, there are 24 national universities, 54 private universities, 40 regional comprehensive universities (called Rajabhat universities, which were originally teacher training colleges and later developed as universities with other departments as well), and 9 Rajamangala technological universities. The university attendance rate in Thailand is 57.1 percent (Japanese Embassy in Thailand website). This rate is largely due to the fact that the two open universities of Ramkhamhaeng University (approximately 470,000 students) and Sukhothai Thammathirat University (approximately 180,000 students) provide citizens with broad opportunities for higher education. Students can enrol in these two universities without any test (Ministry of Education, Culture, Sports, Science and Technology).

Higher education in Thailand is divided into short-term college level courses (for a diploma) and university level courses (for a degree). The period of study for short-term colleges is one to four years, and students are awarded a certificate of graduation or a diploma upon completion. University courses are further divided into undergraduate and postgraduate. Undergraduate courses are four years, and postgraduate degrees range from the bachelor's degrees at one year, master's courses at two years, and doctoral courses at three years.

Admissions evaluation for universities is conducted through the national standardised university entrance examination run by the Thai government, and the independent and individual examinations of each university. Students who are not native speakers of English must submit proof of English ability (e.g. TOEFL scores). Graduate school curriculum mainly consists of compulsory subjects, optional subjects and the master's thesis. After enrolment, students determine their course subjects through consultations with advisors in charge of student support, in order to acquire the necessary credits to obtain a degree.

The Second Long-Term Higher Education Plan (2008-2022) clearly states a plan to develop human resources at universities to manage natural resources and ecosystems. Further, the Thai government aims to promote research and development in scientific and technological fields in order to increase the countries' ability to compete internationally. To this effect, focal policy is being enacted to expand graduate school education and research and development (see later sections on Chulalongkorn University for details).



## ■Asian Institute of Technology, School of Environment, Resources and Development

### 1. Outline of the Asian Institute of Technology School of Environment, Resources and Development

#### (1) Background of Establishment

The precursor of Asian Institute of Technology (AIT), the Southeast Asia Treaty Organisation (SEATO) Graduate School of Engineering, was established in 1959 within the engineering department of Chulalongkorn University, a prestigious university in Thailand. This institution was then established as an independent organisation in 1967 and became the Asian Institute of Technology. AIT promotes technological improvement and sustainable development in the Asia-Pacific region through higher education and research, as well as through dispatching information on these activities. In the background of AIT's establishment was the aim to prevent highly talented persons of Asia from moving to the side of Eastern nations during the cold war, and to bring them closer to the thought of Western nations. For this reason, funding at the time of the school's founding was mostly received from countries of Europe and North America.

In 1991, the existing department of agriculture and the areas of energy and industrial engineering were merged to establish the School of Environment, Resources and Development. At present, the school is made up of ten research areas geared to the needs of the region (agricultural systems and engineering, aquaculture and aquatic resources management, energy, environmental engineering and management, food engineering and bioprocess technology, gender and development studies, natural resources management, pulp and paper technology, regional and rural development planning, and urban environmental management). Two thousand students, mainly international students from the Asia-Pacific region, are enrolled in the school, and 90 percent of graduates go on to work in their home countries or the Asia-Pacific region. Thus, the school has met the expectations outlined for it in its early stages.

#### (2) Aims

The school aims to develop persons of talent for the advancement of scientific technology both inside and outside the Asia-Pacific region to meet global, regional and local needs through cooperation with various stakeholders.

#### (3) Basic Tenants on Education and Research

Research and higher educational activities are advanced based on the basic values listed below.

- High quality education and learning through active participation of students in learning processes;
- Promotion of academic staff research activities via cooperation with the public and private sectors;
- Guarantee of qualitative improvements in all academic activities;
- Assurance of transparency in educational administrative activities in which professors, staff and students participate in decision-making processes;
- Maintenance of neutrality, fairness and respect for individual diversity that is not swayed by race, religion, nationality or gender;

- Cooperative work for comprehensive development through integration of learning, discovery and individual contribution;
- Long-term establishment of networks through partnerships between organisations and individuals both inside and outside the Asia-Pacific region, with recognition of the Asian Institute of Technology as a partner institution in professional education.

The School of the Environment, Resources and Development strives to set itself apart from other universities and research institutions by making special efforts in applied research that actively takes the societal needs of the Asia-pacific into account.

#### **(4) Numbers of Academic Staff and Students (2008-2009)**

Academic staff: 42 full-time, approximately 20 lecturers from external organisations

Administrative office staff: approximately 50

Staff hired for individual projects: approximately 100

Master's course students: approximately 700 (including short term exchange students)

Doctoral course students: approximately 250

Other, short-term international students:

Total graduates at present: approximately 5,700 (as of 2007)

Out of all students, 30 percent enrol directly after graduation from undergraduate programmes, and 70 percent have work experience. Male students comprise 65 percent, and female students 35 percent, of the student body. The average age of students ranges from 30 to 35. There are many married students, and an affiliated elementary school is located within the AIT campus.

Academic staff is hired through international recruiting. Most international students are from Asia. Students from 30 countries are enrolled, including those from Viet Nam, Lao People's Democratic Republic, Cambodia, Bangladesh, Nepal, India, Sri Lanka, Philippines, Republic of Korea, China, and so on.

#### **(5) Expenses (1 baht (THB) = approximately 2.6 yen (JPY), as of February 2009)**

Tuition:

Doctoral course (6 terms, 36 months):

tuition 1,296,000 THB (approx. 3.37 million JPY)

living expenses 414,000 THB (approx. 1.07 million JPY)

Master's course (4 terms, 22 months):

tuition 752,000 THB (approx. 1.96 million JPY)

living expenses 253,000 THB (approx. 660,000 JPY)

Diploma (2 terms, 12 months):

tuition 376,000 THB (approx. 980,000 JPY)

living expenses 138,000 THB (approx. 360,000 JPY)

Certificate (1 term, 5 months):

tuition 188,000 THB (approx. 490,000 JPY)

living expenses 57,000 THB (approx. 150,000 JPY)

Living expenses (average for one month):

15,000 THB (approx. 40,000 JPY, included dormitory fees)

## 2. Image of Ideal Talent (Environmental Leader Concept)

- Talented persons who will take a leading role in the harmonisation of economic development and sustainable development in the Asian region in the fields of environment, resource management, poverty eradication, socioeconomics and gender development.

## 3. Educational Curriculum

### (1) Outline of Educational Curriculum

There are ten fields of study (similar to what is commonly referred to as academic departments in universities) in the School of Environment, Resources and Development.

Details vary according to fields, but all areas issue master's and doctoral degrees, diplomas and certificates.

- **Agricultural Systems and Engineering:** aims to improve understanding of sustainable agriculture through holistic approaches based on agronomic and biophysical factors, from the perspective of the producer and the effects of economic and social forces on agricultural enterprises.
- **Aquaculture and Aquatic Resources Management:** aims to contribute to the development of regional institutional capacity in aquaculture and aquatic resources management through creative approaches that integrate education, research and outreach.
- **Energy:** aims to solve today's energy problems with technological, planning and management responses. Programme places emphasis of the following topics: energy, environment, climate change, renewable energy, energy efficiency, management of energy supply and demand, electric power system management, energy economics and development, and restructuring of energy industries.
- **Environmental Engineering and Management:** focuses on the issues of water resource management, wastewater disposal management, air pollution engineering and management, solid and hazardous wastes engineering and management, waste minimisation and life cycle analysis, environmental impact assessment, and environmental toxicology.
- **Food Engineering and Bioprocess Technology:** focuses on technology in food engineering and bioprocess industries in the areas of material, production and equipment.
- **Gender and Development Studies:** aims to augment understanding of and learn methods of analysis regarding the situations of women, humans, indigenous people, different classes and other social groups, in order to address changes in the society, economy, technology and environment of the Asian region.
- **Natural Resources Management:** aims to develop professionals who will contribute to sustainable management of terrestrial and coastal resources. Addresses the topics of land, forest, wildlife and environmental preservation through integrated educational and research methods and dissemination of research results.
- **Pulp and Paper Technology:** aims to develop technical experts of high quality to be active in the field of pulp and paper industry, in order to address the regional need for sustainable use of resources.
- **Regional and Rural Development Planning:** focuses on poverty of rural areas, improvement of quality of life, and socioeconomic development of rural areas through practical education utilising participatory and integrated approaches.

- **Urban Environmental Management:** deals with urban environmental issues, and particularly focuses on urban poverty, in order to elucidate problems, issues and solutions to urban environmental problems through acquisition of integrated theory and concepts on urban planning.

In order to further address societal needs, the fields of disaster prevention and human settlement education will be offered from next year.

## (2) Course Topics

### ① Energy

Prior study requirements (one of the following)

- electrical engineering (bachelor's)
- mechanical engineering (bachelor's)
- chemical engineering (bachelor's)
- industrial engineering (bachelor's)
- civil engineering (bachelor's)
- physics (bachelor's)
- economics (bachelor's)
- sciences, economics, management and public administration (with a background in energy)

Compulsory courses

- Development and Evaluation of Energy Project
- Energy Resources and Technologies
- Energy, Environment and Climate Change Issues and Strategies
- Workshop on Energy Issues and Communication

Optional courses

- Power System Dynamics and Stability
- Power Sector Management under Deregulation
- Optimisation and AI Applications in Power Systems
- Organisation and Finance of a Power Utility
- Demand-side Management
- Power System Design and Operation
- Power Distribution Systems
- DC and Flexible AC Transmission
- Computer Aided Power System Analysis
- Rural Electrification and Distributed Generation

## ② Environmental Engineering & Management

Prior study requirements (one of the following)

- biochemical or chemical engineering (bachelor's)
- civil engineering (bachelor's)
- environmental engineering (bachelor's)
- sciences, health science and biomedical science (bachelor's)

Compulsory courses

- Environmental Chemistry and Laboratory
- Environmental Quality Management

Optional courses

- Air Pollution and Air Quality Management
- Solid Waste Management
- Environmental Impact Assessment
- Environmental Management and Ethics
- Membrane Technology in Water and Wastewater Treatment
- Water Quality Management
- Air Pollution Modelling and Applications
- Hazardous Waste Technology and Management
- Design of Air Pollution Control Systems
- Principles of Cleaner Production

## ③ Natural Resources Management

Prior study requirements (one of the following)

- environmental science (bachelor's)
- bioscience (bachelor's)
- agriculture (bachelor's)
- soil science (bachelor's)
- natural resources geology (bachelor's)
- geography (bachelor's)
- forestry (bachelor's)
- botany (bachelor's)
- zoology (bachelor's)

Compulsory courses

- Ecological Principles for Natural Resources Management
- Natural Resource Management Issues in Asia
- Research Design for Natural Resources Management
- Land Evaluation and Resource Management
- Integrated Natural Resources Planning and Policy

Optional courses

- Forestry
- Biodiversity and Conservation
- Integrated Land Use Management Systems
- Spatial Information Systems in Natural Resources Management
- Land Degradation Monitoring and Management
- Natural Resources Economics
- Society and Natural Resources

#### ④ Urban Environmental Management

##### Overview courses

- Foundations and Principles of Urban Environmental Management
- Research Methods and Techniques
- Applications of Research Methodology

##### Compulsory courses

- Urban Environmental Planning and Management Workshop
- Management of Environmental Standards
- Governance and Urban Management
- Environmental Economics and Finance

##### Optional courses (from the urban environmental management field)

- Environmental Policy
- Environmental Planning and Design
- Management of Urban Housing, Infrastructure and Services
- Environmental Treaties

##### Optional courses (from outside the urban environmental management field)

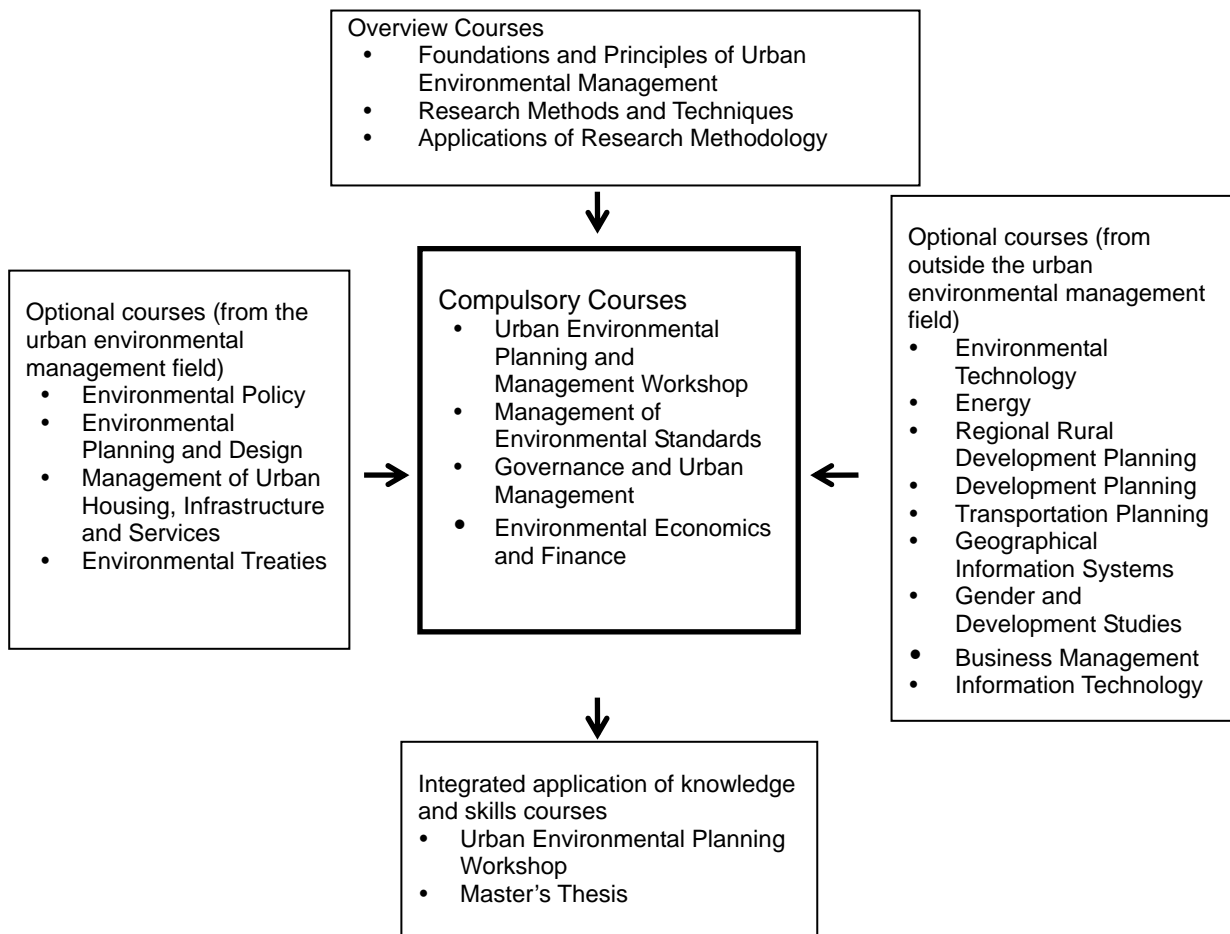
- Environmental Technology
- Energy
- Regional Rural Development Planning
- Development Planning
- Transportation Planning
- Geographical Information Systems
- Gender and Development Studies
- Business Management
- Information Technology

##### Integrated application of knowledge and skills courses

- Urban Environmental Planning Workshop
- Master's Thesis

### (3) Distinguishing Characteristics of Educational Curriculum

Figure 11: Structure of the Urban Environmental Management Course



The educational curriculum is constructed to reflect regional needs, and aims to be area-spanning, innovative and excellent.

### (4) Distinguishing Characteristics of Educational Methodology

There is often a gap in the English language abilities and educational levels of international students of differing socioeconomic backgrounds at the time of enrolment. Enrolment is approved for international students with comparatively low levels of English ability and education, with expectation of the potential for future individual growth. The school offers a pre-enrolment preparation course for these students. The preparatory course covers the subjects of English, mathematics, statistics, and so on, but extra tuition is required to take these courses. Following admission, students are provided with tutors and mentors to consult regarding course content and daily life as necessary.

Each student is assigned an advisor, who gives support in course selection and coursework. Advisors for the first year are determined automatically upon enrolment, but from year two, students may change advisors as required based on respective research topics.

Although all courses are conducted in English, most professors are not actually native speakers of English. For this reason, problems arise such as difficult-to-understand accents. However, students normally adjust to the English of professors during their first term of study, thus solving the problem.

Most courses are made up of pre-class readings, PowerPoint lectures, field visits, mid-term and final examinations, and preparation of reports. Student attitudes towards class differ by country. For example, students from Southeast Asia rarely speak out in class, where as students from East Asia often do. Professors make efforts to facilitate the active participation of Southeast Asian students by asking for examples from their countries and posing questions. The opportunity to study in an international environment, interacting with people of differing cultures, is an important experience for students.

The educational methodology of programmes is based on both in-class lectures designed for mastery of knowledge and classes in the field designed for acquisition of practical skills. In field lectures, students actually visit sites for a certain period of time to undergo practical training. During this time, they gain understanding of the local problem, assess the present situation, elucidate key issues, and prepare proposals for improvements. These proposals are submitted to relevant local governing bodies.

#### **(5) Method of Course Assessment**

In a typical assessment method, the mid-term and final exams are each given a weight of 40 percent of grade, and a project is weighted at 20 percent, but percentages differ by course. For field courses, the weight given to projects is higher. Classes typically have 20 to 25 students.

#### **Example**

##### **Waste Reduction and Recycling**

Assessment: mid-term exam 30%, final exam 50%, assignments/projects 20%

Course content:

- I. Principles of composting
- II. Process design to maximise methane production
- III. Photosynthesis in waste treatment
- IV. Biochemical reactions in waste-fed fish ponds
- V. Functions of aquatic plants
- VI. Land treatment of wastewater
- VII. Land treatment of sludge
- VIII. Application and utilisation of reclaimed products
- IX. Research and development needs; case studies

The course focuses on topics regarding theoretical foundations and strategies for waste reduction, technology and management criteria, use of reclaimed products, and health impacts. There is no laboratory work included in the course.



### **Environmental Quality Management**

Assessment: mid-term exam 40%, final exam 40%, projects 20%

Course content:

- Environmental quality issues (quality index, environmental standard setting, environmental standards, emissions standards)
- Environmental management systems
- Environmental protection and human development
- Environmental monitoring
- Establishment of criteria and standards
- Case study on environmental agreements
- Global environmental issues
- Environmental impact assessment
- Risk assessment
- Environmental technology verification

### **Environmental Health and Sanitation**

Assessment: mid-term exam 40%, final exam 40%, assignments/projects 20%

Course content:

- I. Global situation of water supply and sanitation
- II. Water and life
- III. Human excreta and its characteristics
- IV. Infectious diseases caused by toxic chemicals
- V. Epidemiology of pathogens and water-borne diseases
- VI. Disinfection and its alternatives
- VII. Design of small-scale septage treatment systems
- VIII. Household centred environmental sanitation (HCES) model
- IX. Introduction of material flux analyses (MFA) on environmental sanitation
- X. Hygienic education and integrated approach to health and sanitation

This course highly emphasises the role of hygienic education in the prevention of water borne as well as fecal contaminant diseases. An integrated approach to health and sanitation problems is taught throughout the course, including suggestions and solutions for an appropriate behavioural and strategic plan on this issue.

## **Environmental Management and Ethics**

Overview of lecture: This course will provide an overview of useful concepts and methods of environmental management. The course aims for students to master concepts and knowledge on the five topics below in order to select and apply environmental engineering approaches in the context of a new spectrum of managerial options.

Assessment: mid-term exam 40%, final exam 40%, assignments/projects 20%

Course content:

### I. Environmental science

1. Cause-effect relationships
2. Empiricism
3. Determinism
4. Stochasticity
5. Modelling and scientific reasoning

### II. Environmental engineering

1. Mass flow in society
2. Urban metabolism
3. Media transfers
4. Life cycle analyses
5. Engineering options and ultimate solutions

### III. Environmental economics

1. The dilemma of the commons
2. Cost-benefit analysis
3. Value-estimation
4. Economic instruments

### IV. Environmental ethics

1. Anthropocentric versus ecocentric concepts
2. Utilitarian versus deontological and teleological thinking
3. The precautionary principle

### V. Environmental management

1. Working with rules, consensus, economics and ethics
2. DPSIR analysis
3. Examples: DDT, Hg, Cd, PCB, CFC, ABS and LAS, Pb, and MTBE in petrol, urban smog, water treatment and reuse, nutrients (N, P)

## **(6) Method of Academic Staff Assessment**

The first stage of student evaluation of lectures is conducted during the mid-term examination period when students submit written requests. These demands are then reflected on the latter half of the lecture course. At the end of the term, students evaluate lectures (professors) using evaluation forms (both paper and electronic forms). Students can confirm their grades in the course upon submission of the evaluation form to the university committee. Further the university evaluates instructors based on numbers of students in lectures, participating projects, publications and numbers of graduates for whom the professor was responsible.

## **(7) Process of Curriculum Design**

The curriculum is constructed to include the content of the United Nations Millennium Development Goals (peace and security, development and poverty, environment, human rights and governance, and regional concerns) in order to maintain an international quality and to give consideration to regional concerns. A proposal for curriculum content is drawn up at a meeting of the school's instructors, and is finalised by certification of the vice president of academic affairs of the Asian Institute of Technology.

Founding of new areas of research or discontinuation of other areas is determined based on regional needs, student demands and availability of funding. When certain research areas are discontinued, a portion of contents are combined into other research areas.

## **(8) Funding**

School administration is based on external project administration funding totalling 190 million THB, and student tuition totalling 200 million THB. These funds are utilised mainly for the salaries of professors and staff, support for student research, research, and research facility maintenance.

#### **4. Relationships with External Organisations and Communities**

The Asian Institute of Technology, a higher education and research institute, conducts numerous projects based on external funding. In 2007, there were approximately 50 projects, and in 2008, approximately 45 new projects were initiated. AIT has cooperative relationships in Japan with the University of Tokyo, Kyoto University, Nagoya University and IGES. Students and academic staff participate together in projects, through which they gain materials for research topics.

##### **Examples of Cooperative Relationships**

- **Research Partnerships for Sustainable Development.** This 12-year project began in 2001 and is funded with support from the Swiss National Science Foundation. The project works on four research fields (sustainable development and natural resources, governance and disputes, lifestyle and globalisation, health and environmental health), operates nine regional offices and has eight field-spanning sub-projects. One member of the academic staff of AIT acts as coordinator for the regional offices, who is also in charge of the environmental health research project. Research has been expanded to cover not only areas in engineering, but also to include social science to allow for research on the sustainability of social systems as a whole.
- **Southeast Asia Urban Environmental Management Applications Project (SEA-UEMA Project).** This project was initiated in 2003 on funding from the Canadian International Development Agency (CIDA), and is to be completed in 2010. A full-time project manager from the Urban Environmental Management field of study works at the project office. With gender as a cross-cutting theme, the project is made up of research in four areas (graduate education, flagship projects, policy advocacy, and learning networks and training). At the project's beginning, eight countries participated. These were Malaysia, Philippines, Cambodia, Indonesia, Viet Nam, Thailand, Lao People's Democratic Republic, and East Timor. However, at present there are only seven countries in the project as Malaysia is no longer a target of ODA from Canada. Concrete topics include case study research on urban composting, sustainable urban transportation, and sustainable urban activity. Representatives of local governing bodies in participating countries are involved in the project along with six main academic staff members. As graduate education is designated as one of the research fields, the project also provides scholarships for students in the urban environmental management field of study. A portion of these students are sent from local governing bodies of participating countries.

#### **5. Conditions for Admission**

##### **(1) Application for Admission**

The following documents are necessary for admissions applications.

- application form (including statement of purpose)
- transcripts of grades
- TOEFL scores
- two letters of recommendation
- research plan (for doctoral course applicants only)

## **(2) Conditions of Admission and Evaluation Standards for Selection of Applicants**

- a bachelor's degree in engineering or a related field from a four-year university
- a degree from a highly renowned educational institution
- well above average academic achievements
- physical and mental health to undergo graduate education
- English ability (a score of 500 or above on the TOEFL)

## **6. Student Futures**

### **(1) Paths after Graduation**

Most students have work experience, and in many cases are sent from governmental institutions in particular. For this reason, most graduates return to their places of employment. In many instances, a condition for receipt of scholarship funds is the requirement that the student return to his or her home country for employment after graduation. Approximately 20 percent of master's students continue on to doctoral courses.

For the above reasons, until recently job search activities have largely been left up to the students themselves, and the university did not conduct any official support for employment. Of late, an office for employment support has been established. Likewise, career fairs recently have been conducted on campus. Participating groups in career fairs include the Asian Development Bank (ADB), international organisations, NGOs, Thai and Japanese private enterprises and so on.

### **(2) Methods of Network Building between Graduates**

An alumni network is set up and maintained by AIT as a whole. This network manages a website, issues newsletters, and prepares annual reports. Further, there are alumni groups organised in 27 countries in Southeast Asia, South Asia, the USA, and Europe.

## **7. Other**

### **(1) Internships**

There are several Asian offices of international organisations located in Bangkok. Consequently, there are students who engage in internships at these organisations. In general, there are few examples of internships in industry, and internships are not included as a compulsory part of curriculum. On the other hand, many students participate in the research projects of university professors, through which they perform internships. Most interns engage in research assistance, by which they earn approximately 2,000 THB monthly.

## **(2) Scholarship Programmes**

Generally students from developing countries in the Asia-Pacific region have economic limitations and require funding support to undergo university education. For this reason, almost all students utilise scholarship programmes. Scholarships are provided by a variety of organisations, including the Thai government, the Japanese government, governments of Europe and the USA, and NGOs. Potential areas of study and nationality of students are determined based on the differing organisations that provide scholarships. Of course, grades are also considered. As such, acquisition of scholarships is influenced by the conditions of each country. For example, students from Myanmar, where the ruling military obstructs democratisation, face difficulty in receiving scholarships. In general, a certain level of academic achievement at the undergraduate level is a requirement of scholarships.

### Example of Organisations Providing Scholarships

- Japan International Cooperation Agency (JICA)
- Commission on Higher Education, Thailand
- Canadian International Development Agency (CIDA)
- United Nations Development Programme
- Ford Foundation (USA)
- World Bank

## **(3) Student Life**

Most international students and domestic students live in dormitories set up on the campus of AIT. There are also family dormitories, and monthly rent is about 1,500 to 3,000 THB. Most students gain income from research assistant positions in research projects. However, AIT restrictions limit student working hours to within 40 hours per month.

## **8. Future Issues**

Administration of the Asian Institute of Technology is largely dependent on funding support from the Thai government and foreign governments, including Japan. For this reason, there is no so-called core fund. AIT plans to work to stabilise sources of funding through expanding sources to those outside of government. Provision of stable scholarships is closely tied to maintaining high quality students, and therefore is an important issue.

Most international students graduating from the School of Environment, Resources and Development go to work in the public sector. Compared to the private sector, salaries of the public sector are low. When thinking of government scholarships as investments, some criticise that the amount of investment is not appropriate. However, in the long term human resource development in the public sector is indispensable to construction of societal foundations. A mechanism is needed for talent developed in the environment, resources and development fields to become an active work force in the regional society. Governments must acknowledge that this talent is able to respond to the needs of society. As such, government investment (scholarships) in human resource development for the public sector will become sustainable.

## 9. Summary

In 2009 the Asian Institute of Technology will celebrate the fiftieth anniversary of its founding. It continues to make the most of its geographic location to endeavour in human resource development towards contribution to sustainability in the Asian region as a whole. AIT continues efforts to increase its activities as an international institute for education and research, while strengthening cooperative relationships within the Asian region, and aiming to be approved as an international organisation. Based on foundations in engineering, AIT now conducts integrated educational activities, including a variety of socioeconomic fields such as urban management, gender development, and resource management. AIT regularly engages in improvement of research fields, aiming to produce talented persons to meet the region's needs. One million JPY is required for student expenses yearly, as well as 300,000 JPY in other costs. Most students are from developing countries of the Asian region who enrol based on scholarships from their own countries or those from OECD countries. For this reason, most students have work experience. In this case, graduate education at the school is considered training for persons who already have positions in society.

All academic staff is recruiting internationally, and external funding is acquired through collaborative projects with external organisations. The school devises to enrich the educational and research activities of students and professors by strengthening cooperative relationships with educational institutions in other countries, private enterprises and international organisations. In order to improve the quality of students and ensure they continue in courses, a pre-term programme is held including English study and other necessary course subjects. Further, students receive support from professors and academic advisors throughout the term. Most students master practical education and research knowledge and skills by getting involved in the projects of professors. Most lectures include group work and presentations, and efforts are made to improve the interpersonal skills of students. Most students are not native English speakers, and feel pressured after enrolment by changes in lifestyle, participation in lectures and a variety of necessary adjustments. However, through two years of education and research activities, students develop international qualities and academic abilities, as well as techniques. Over 90 percent of graduates of the school, which aims to develop human resources to contribute to sustainable social development in the Asian region, are active in the Asian region.

The school supports its activities through funding from the Thai government, and the governments of Japan, European countries and the USA. A future issue is securing external funding for student scholarships and research projects. For this purpose, it is hoped that both academic staff and students continue to expand high quality educational and research activities.

## Appendices

### 1. List of Interview Subjects

Name (nationality)	Position
Dr. Thammarat Koottatep (Thailand)	Assistant Professor, Environmental Engineering and Management, School of Environment, Resources & Development
Prof. S. Kumar (India)	Professor and Dean, School of Environment, Resources & Development
Prof. Chongrak Polprasert (Thailand)	Professor of Environmental Engineering Former Dean of School of Environment, Resources & Development
Dr. Edsel Sajor (Philippines)	Professor, Urban Environmental Management
Dr. Muhammad Abu Yusuf (Bangladesh)	Project Manager

### 2. List of Reference Materials

- Academic Requirements and Procedures for the Master Program: Brochure*, Asian Institute of Technology
- AIT Credit Requirements: Master Program*, Asian Institute of Technology
- Annual Report 2007*, Asian Institute of Technology
- Research Partnerships for Sustainable Development: Brochure*, National Centre of Competence in Research North-South
- School of Environment, Resources and Development, *2008 Summer Courses*, Asian Institute of Technology
- School of Environment, Resources and Development, *Agri-business Management: Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Aquaculture and Aquatic Resources Management "Planting seeds in minds and water": Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Southeast Asia Urban Environmental Management Applications (SEA-UEMA) Project: Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development: *Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Course Description: Energy, Field of Study Offers, Doctoral, Master's Degree and Certificate Programs with Specializations in Electric Power System Management, Energy Economics and Planning, and Energy Technology*, Asian Institute of Technology
- School of Environment, Resources and Development, *Course Description: Post Graduate Certificate Program on Sustainable Energy Technologies*, Asian Institute of Technology
- School of Environment, Resources and Development, *Gender and Development Studies: Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Food Engineering & Bioprocess Technology: Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Protecting Asia's Environment Enhancing Sustainable Development: Poster*, Asian Institute of Technology
- School of Environment, Resources and Development, *Regional and Rural Development Planning: Brochure*, Asian Institute of Technology
- School of Environment, Resources and Development, *Urban Environmental Management, Field of Study: Brochure*, Asian Institute of Technology



## **Publications**

- Coowanitwong, Nowarat, Shapkota, Prajapati, Pradhan, Pravakar, and Leilani, Gallardo, *Abstracts: International Conference on Sustainable Urban Environmental Practices, "Greener Cities: A Legacy for the Future"*, October 2008, Pathumthani, Southeast Asia Urban Environmental Management Applications (SEA-UEMA) Project.
- "Clean Energy for the Urban Poor: an Urgent Issue"*, Global Network on Energy for Sustainable Development.
- Kumar, S, Barua, Dipal C., Dung, Trinh Q., Ibrahim, Muhammad, Samy, Sat, Sayalath, Phouvong, and Sharma, Dinesh, *"Demonstration and Monitoring of PV systems: Lessons Learned"*, Swedish International Development Co-operation Agency, Asian Institute of Technology.
- Permana, Ariva Sugandi, and Perera, Ranjith, *"Monograph: Land Use and Transport as Determinants of Air Quality: A study in Bandung, Indonesia"*, October 2007, Pathumthani, Southeast Asia Urban Environmental Management Applications (SEA-UEMA) Project.
- Perera, Ranjith, *SEA-UEMA Project Case Study Series: "Unlocking the Potential of Community Composting Towards the Establishment of an Eco-neighbourhood"*, September 2008, Pathumthani, Southeast Asia Urban Environmental Management Applications (SEA-UEMA) Project.

## ■Chulalongkorn University

Established in 1917, Chulalongkorn University has the longest history of any Thai university, and is known as the number one school in the country. As of 2007, the university offers 61 international programmes and has over 80 research projects. The university aims to actively engage in education related to environmental problems and enthusiastically pursues cooperative relationships with external organisations. Environmental education is a course offered in the education department, and the Research and Development Centre for Sustainable Development Education was established and conducts joint projects with governments, international organisations and NGOs. This research examined the Hazardous Waste Management specialisation of International Postgraduate Programmes in Environmental Management, as well as the International Programme in Environment, Development and Sustainability.

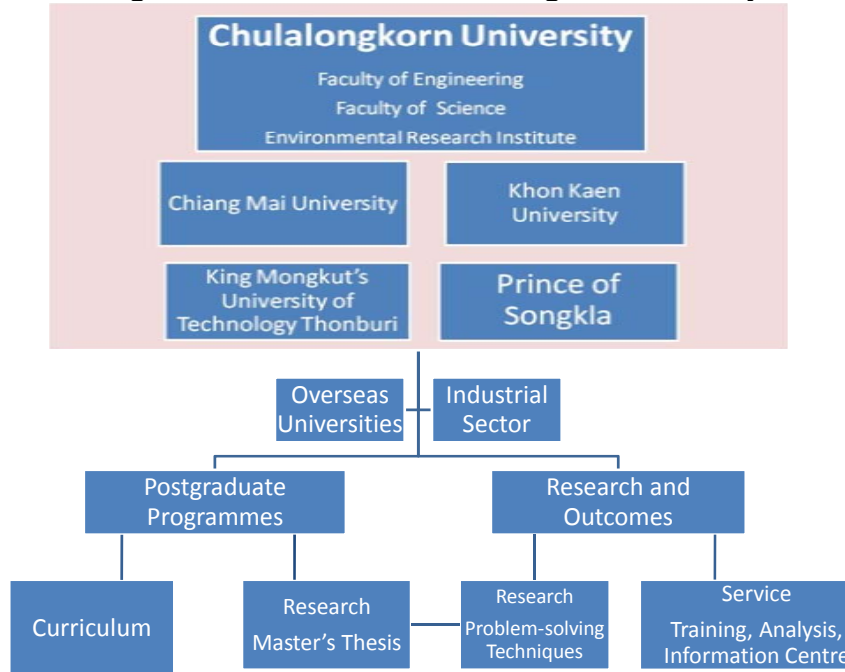
## ■Chulalongkorn University International Postgraduate Programmes in Environmental Management, Hazardous Waste Management Specialisation

### 1. Outline of the Hazardous Waste Management Specialisation of the International Postgraduate Programmes in Environmental Management

#### (1) Background of Establishment

The government of Thailand promotes graduate school education and research activities in science and technology fields in order to improve the field of research and development and to develop human resources for the private sector, with the aim of increasing the country's ability to compete internationally. In 1996, the Thai Ministry of University Affairs designated five focal areas for domestic development of science and technology (basic science, biotechnology and agricultural production industry, engineering and physical science, information technology, and environmental science and technology). Along these lines, in 1999 the Thai government initiated a project in higher education development based on financing from the Asian Development Bank (No. 1699-THA). This project is currently in Phase Two (2006-2009), during which nine distinguished research bases have been established. Activities are run through a consortium of industry and educational organisations, based on the recognition that the cooperation of multiple educational and research organisations and the industrial sector is necessary for research and development as well as development of human resources. Of the nine research bases, the national centre for hazardous waste management was established at Chulalongkorn University. This centre engages in research and development and postgraduate education. The International Postgraduate Programmes in Environmental Management were established in 2000, in which education and research activities are conducted in cooperation with eight domestic universities, six overseas universities, and multiple businesses and international organisations (see figure 12).

Figure 12: Structure of Chulalongkorn University



In the background of this programme's initiation is an incident which happened over ten years ago when hazardous waste was illegally dumped off the coast of Thailand, raising issues of environmental impact. Thus reasons for establishment include the necessity for development of human resources to solve this problem domestically. The programme came to be conducted in English due to the Asian currency crisis which began in Thailand in 1997. The government could no longer secure scholarships for overseas studies. Thus, a programme in English of equal educational level to that of overseas universities came to be held in Thailand, while holding costs down.

## (2) Aims of the Programme

- To produce excellent students with the knowledge and skills to effectively manage the environment
- To promote research of an international standard

## (3) Basic Tenants on Education and Research

The programme aims to conduct education to maximise the capacity of each student so that he or she can give full play to his or her superior leadership in activity at the national level.

## (4) Numbers of Academic Staff and Students

Academic staff: 4 persons in charge of the programme, 3 full-time instructors

Full-time staff: 4 persons

Master's course students: 70

Doctoral course students: 56

Graduates to date: 195 (150 from master's courses, and 45 from doctoral courses; as of 2007)

Other than the academic staff in the figures above, there are approximately 80 instructors from consortium universities and organisations who are involved in the programme through participation in research and research and thesis preparation instruction to students.

There is a larger percentage of women students. In 2008, 80 percent of students enrolled were women.

## **(5) Expenses**

Tuition: One year 200,000 THB

## **2. Image of Ideal Talent (Environmental Leader Concept)**

- Human talent with both the knowledge and skills to manage the environment.

## **3. Educational Curriculum**

### **(1) Outline of Educational Curriculum**

The programme is conducted through a consortium of domestic and overseas universities, research institutions and private enterprises. All lectures are conducted in English. For this reason, courses of the programme are conducted as one month modules. Professional courses and degrees are as follows.

#### Professional Courses

- Industrial ecology, utilisation of waste
- Sustainable consumption and production
- Hazardous waste treatment
- Technology for restoration and improvement of polluted areas
- Environmental impact and risk management
- Chemistry and hazardous waste management policy

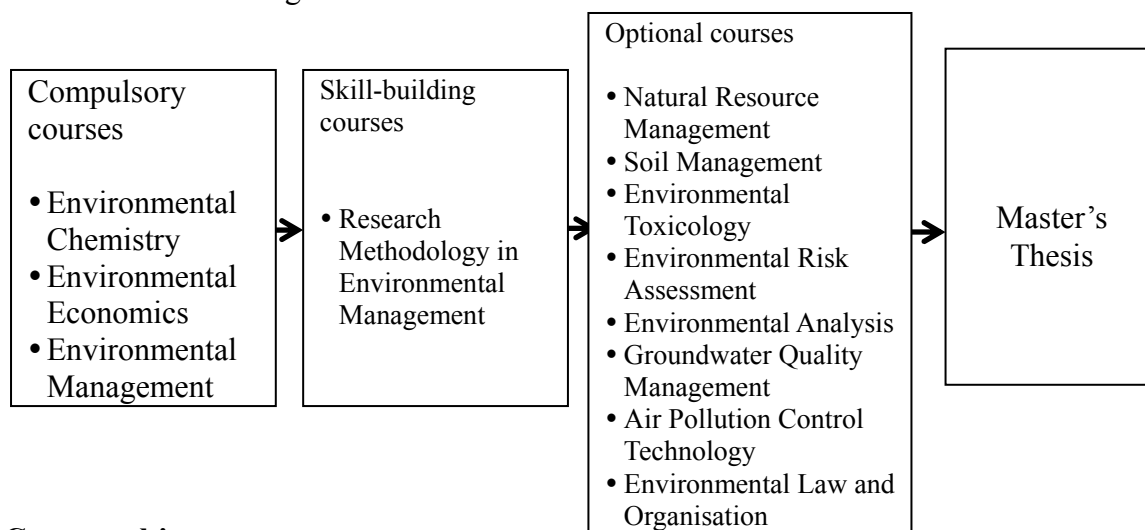
#### Degrees which can be obtained

- Master's degree: 36 credits required for graduation (9 credits in foundational courses, 6 credits in compulsory courses, 9 credits in optional courses, 12 credits for master's thesis).  
Structured as a two-year programme (graduation within four years required)
- Ph.D. (for those with a master's degree): 48 credits required for graduation, 2 papers published in international journals (12 credits in optional subjects, 36 credits for doctoral dissertation)
- Ph.D. (for those enrolling directly from undergraduate studies): 72 credits required for graduation, 2 papers published in international journals (9 credits in foundational courses, 6 credits in compulsory courses, 9 credits in optional courses, and 48 credits for the doctoral dissertation)

### **(2) Distinguishing Characteristics of Educational Curriculum**

Aside from existing engineering courses, the programme includes social science and environmental management courses as compulsory, giving consideration to development of leadership and the restoration of research and educational activities in society.

Figure 13: Structure of Master's Course Curriculum



### (3) Course subjects

#### Master's Course:

##### Compulsory courses

- Environmental Chemistry
- Environmental Economics
- Environmental Management
- Solid and Hazardous Waste Management

##### Skill-building course

- Research Methodology in Environmental Management

##### Optional courses

- Natural Resource Management
- Soil Management
- Environmental Toxicology
- Environmental Risk Assessment
- Environmental Analysis
- Groundwater Quality Management
- Air Pollution Control Technology
- Environmental Law and Organisation

##### Master's thesis

#### Doctoral course:

##### Optional subjects (6 credits)

- Environmental Analysis
- Environmental Risk Assessment
- Environmental Toxicology
- Integrated Pollution Prevention
- Improvement of Regional Environment
- Solid and Hazardous Waste Management
- Technology of Solid and Hazardous Waste Treatment
- Environmental Chemistry

##### Skill-building and holistic knowledge courses

- Research Methodology in Environmental Management
- Environmental Economics
- Environmental Management

##### Doctoral dissertation

#### **(4) Distinguishing Characteristics of Educational Methodology**

All lectures are conducted in English. As the programme is administrated in cooperation with numerous domestic and overseas universities and private enterprises, courses are not held on a set day of the week throughout a term. Rather, they are held in intensive three-week to four-week modules. Prior to courses in environmental management, an intensive English course is held. For the three to four-week modules, an instructor from a US university takes charge of the first half, and an instructor from Chulalongkorn University is in charge of coordinating lectures. The final half of the module is conducted by a Chulalongkorn instructor. This system in effect leads to training of the Chulalongkorn instructors. Instructors from the US play a role in augmenting the education and research activities of the programme as a whole through joint authoring of papers with Chulalongkorn instructors, and providing students with research and thesis instruction. A full-time lecturer in English is on hire who conducts supports for English improvement, such as support in writing skills.

While at present instructors of Chulalongkorn University are in charge of the latter half of intensive courses, at the time of programme establishment, instructors from the US were put in charge of entire courses. At that time, Chulalongkorn instructors participated in lectures for their own training.

Depending on the lecture, presentations and group work are assigned towards improvement of student leadership ability. Decisions on this type of content are left up to the discretion of the instructor. However, there are no classes which particular cover interpersonal skills such as presentation, negotiation and discussion. A course on research methodology, entitled “Research Methodology in Environmental Management” is compulsory. Further, the programme requires students to present research at related academic meetings, and encourages presentations at international academic conferences. If presentations at international academic conferences are not possible, presentations at domestic academic conferences are conducted. Students are assigned thesis advisors based on research topics.

Most Thai students do not speak out in classes, and lectures consist mainly of explanations from instructors. This situation is not a result of a problem with English language, rather related to the attitudes of Thai students. Instructors do make efforts to encourage participation by posing questions to students. Few questions are asked by students in classes, and in most cases students ask questions in their native language of Thai after classes are finished.

Doctoral students are given opportunities to present as needed in order to confirm the state of progress of research, and instruction is given on these occasions.

## **(5) Method of Course Assessment**

### **Example**

#### **Environmental Analysis**

Assessment: quiz 10%, mid-term examination 40%, final examination 50%

Course content:

#### **First half**

- I. Overview on environmental pollutants, sampling and measurements
- II. Environmental chromatography and mass spectrometry
- III. Molecular biology techniques
- IV. Analytical instrumentation, laboratory visit
- V. Quiz (one hour), sample preparation techniques
- VI. Vocs in air, water and soil
- VII. Mid-term

#### **Second Half**

- I. Fundamentals of spectroscopy
- II. Atomic spectroscopy for measurement of metals
- III. Atomic absorption spectrometry
- IV. Inductively coupled plasma absorption emission spectrometry
- V. Sampling and quality control in environmental analysis
- VI. Seminar
- VII. Specific examples of pollution monitoring
- VIII. Specific examples of pollution monitoring 2
- IX. Final exam

#### **Solid and Hazardous Waste Management**

Assessment: mid-term examination 25%, term project report 15%, term project presentation 10%, final examination 50%

Course content:

#### **Hazardous Waste**

1. Overview of hazardous waste management
2. Physicochemical Treatment Process
3. Stabilisation/solidification process, thermal treatment process
4. Biological treatment process
5. Land treatment process
6. Field visit
7. Term project presentation
8. Term project presentation
9. Midterm exam

#### **Solid Waste**

1. I. Introduction  
Solid waste II: sources, characteristics and collection
2. Solid waste III: recycling, thermal and biological processes
3. Solid waste IV: Landfill
4. Seminar and presentation of case for homework (individual)
5. Hazardous waste I: significance, characterisation and laws
6. Hazardous waste II: source management, generation and collection
7. Hazardous waste III: treatment
8. Hazardous waste IV: landfill and contaminated land

## **Advanced Issues in Environment, Development and Sustainability**

Assessment: assignments 20%, term project 70%, participation 10%

Course content:

- Overview of advanced issues in environment, development and sustainability
- Global sustainable development governance: responses to global environmental changes
- Globalisation, regional and national development in the context of sustainable policy
- International development: practical experiences at global and regional scales
- National development: practical experiences from the Royal Development Projects
- Economics of environment and sustainable development projects
- Environmental management and innovation strategies: EIA and SEA projects
- Participation and stakeholder involvement in environmental governance projects
- Major environmental milestones in international environmental diplomacy and the key multilateral environmental agreements (MEAs)
- The Rio Conventions
- Climate change and development projects
- Biodiversity and development projects
- Desertification and development projects
- IUCN, shaping a sustainable future
- Term project presentation
- Term project presentation

This course aims to augment understanding on global scale changes and various issues related to environment, society, development and sustainability. Classes are made up mainly of project and presentation work.

## **Development Theory and Practice**

Assessment: to be discussed in class. (choices: 1) book or article review, 2) group work on comparative development approaches, 3) essay on theory and practices)

Course content:

- Introduction: scope and methods
- Development ethics and social changes
- Modernisation dependency
- Neo-liberalism
- Alternative development thinking I: sustainable development
- Alternative development thinking II: human security, human development
- Mid-term--student book reviews
- East Asian development model, post Washington Consensus and social democracy
- Alternative development thinking III: rights based approach
- Seminar on comparative approaches
- Politics of development and democracy
- International development strategies
- Development indicators and impact assessments
- Student seminar
- Student seminar

This course aims to augment understanding related to three major topics. These are, 1) scope and methods in development studies, 2) theory of development and development approaches, and 3) development practices: major strategies used by international agencies and the prevailing trends in developing countries, particularly East Asia. Classes are made up of lectures, seminars, workshops, assignments, and preparation of class papers.



## **(6) Method of Academic Staff Assessment**

Evaluation of academic staff is carried out for each lecture by distributing an evaluation form. The same evaluation is conducted for foreign instructors. Points of evaluation include student research, contribution to thesis instruction and contribution to project proposals. Instructors with poor evaluations are in some cases not invited to return the next year.

## **(7) Process of Curriculum Design**

At the time of establishment, the curriculum was based on that of a technical university of the United States. Curriculum design is determined via meetings of instructors from consortium universities.

At present, establishment of new courses in energy and food issues is being considered to respond to the needs of the region and modern society.

## **(8) Facilities**

As previously mentioned, the programme was initiated based on financing from the ADB. At that time, efforts were made to enrich facilities and equipment was purchased. At present, there are laboratory facilities fully equipped with instruments for analysis and multiple specialised libraries.

## **(9) External Funding**

The programme received financing from the ADB at its outset, and at present receives the following types of external funding.

- Chulalongkorn Research Funding
- DuPont Research Funding
- Research funds from the Thai government and private enterprises

## **(10) Method of Programme Auditing**

There is no evaluation of the programme by external organisations; however, Chulalongkorn University policy requires programmes to undergo improvements every three years. Chulalongkorn University also evaluates each academic department and programme by its achievements in publications. As of 2006, this programme was ranked eighth.

## **4. Relationships with External Organisations and Communities**

Examples of cooperative activities with external organisations include joint research, seminars and conferences, guest lectures, student exchange, instruction in student research and theses, mutual acquisition of degrees, short-term exchange programmes, and dual degree programmes. As outlined below, cooperative relationships are conducted with a variety of organisations. Content of activities differs for each organisation.

## **Universities**

The programme is administrated through a consortium of universities. The following educational institutions are participating.

### Thailand

- Chiang Mai University
- Khon Kaen University
- King Mongkut's University of Technology Thonburi
- Prince of Songkla University
- Thammasat University
- Kasetsart University
- Ubonrajathanee University

### USA

- New Jersey Institute of Technology
- University of Oklahoma
- North Dakota State University
- Iowa State University

### Taiwan

- Chia Nan University of Pharmacy and Science

### Germany

- Wageningen University

### International Research Institutes

- Asian Institute of Technology
- INSA Toulouse

While at present there are universities from Europe, the USA, Taiwan and Germany officially participating in the consortium, future plans exist to strengthen ties with Japanese universities as well. To this effect, the programme has hired two young full-time instructors who obtained doctoral degrees at Japanese universities (University of Tokyo, Tohoku University).

## **The Private Sector**

The programme promotes continuing relationships with private enterprises. Efforts are being made to convert individual networks into organised cooperative relationships, via distribution of research results and so on. At present, cooperative relationships exist with the following private enterprises.

- DuPont
- Bangchak Petroleum Public Company Limited
- Pha Daeng PCL
- Siam City Cement PCL
- Asia Cement PCL
- Thai Power Supply Co. Ltd.

## **The Government of Thailand**

- Pollution Control Department
- Department of Industrial Works
- Department of Groundwater Resources
- Industrial Estate Authority of Thailand
- Chulachomklao Royal Military Academy

## **International Organisations and NGOs**

- United Nations Environment Programme
- Greening of Industry Network
- Global Reporting Initiative
- Asia-Pacific Roundtable for Sustainable Consumption and Production
- United Nations Development Programme

## **5. Conditions for Admission**

### **(1) Admissions applications**

The following documents are required for admissions applications.

- application form
- transcripts of grades
- TOEFL score or the Chulalongkorn University Test of English Proficiency (CU-TEP)
- three letters of recommendation
- statement of purpose
- five photographs for identification
- copy of identification
- application fee of 700 THB

### **(2) Conditions of Admission and Evaluation Standards for Selection of Applicants**

- a bachelor's degree from a four-year university in science, engineering or a related field
- well-above average academic achievements
- contents of letters of recommendation
- work experience
- English ability (TOEFL score of 500 or above)
- motivation, leadership, problem-solving ability, positive attitude toward education and research activities and professional manner of applicant

### **(3) International Students**

At present, there is one student from Malaysia, one student from Pakistan, and two students from Germany.

## **6. Student Futures**

### **(1) Paths after Graduation**

About half of programme participants are working students sent by their employers, which include research institutes, government, and private enterprises. These working students return to their employing organisations upon completion of the programme. Further, five to ten percent of master's course students continue studies in a doctoral course.

For the most part, students find employment themselves after graduation. Employment found in the private sector is mainly in environmental management sections, treatment facilities and safety management positions at oil companies and manufacturing companies. Also some students find employment at consulting companies. Most doctoral course graduates find employment at research or educational institutions.

## **(2) Alumni Networks**

Establishment of an alumni network is currently under deliberation. At present, the programme does not manage an organised alumni network nor maintain career information on graduates.

## **7. Other**

### **(1) Internships**

Internships are not included as compulsory subjects in the curriculum, but in some cases students participate in research cooperation with affiliated businesses.

### **(2) Scholarship Programmes**

Over 90 percent of students receive scholarships. About 60 to 70 percent of these students receive scholarships which cover the full costs of tuition and living expenses. The other 30 percent receive scholarships which pay a portion of tuition and living expenses.

Students sent from the Pollution Control Department, the Mineral Resources Department, Chulalongkorn University, Mahidol University, and Thammasat University receive scholarships to pay all expenses.

Examples of Organisations Providing Scholarships:

- Thailand Commission on Higher Education
- The Golden Jubilee Network
- The Thai Centre of the International Journal of Occupational and Environmental Health

## **8. Future Issues**

Ongoing training of instructors and students is necessary to continue to produce high quality results. Bringing in lecturers from overseas is essential to this effort, but this also depends largely on administrative funds. Current administration of the programme is greatly dependent on funding from the Thai government. The programme must devise to achieve stabilisation of funding through acquiring funding from sources other than governments.

## 9. Summary

This programme, held at a leading Thai university, was established in 2000 with support from the Thai government and the ADB, as a part of efforts to promote postgraduate education and research activities in science and technology fields. These efforts are aimed at improvements in the field of research and development and development of human resources for the private sector. This programme conducts educational activities and human resource development within cooperative relationships among Chulalongkorn University, 14 domestic and overseas universities, private enterprises, and research institutes with funding from the Thai government and other domestic and overseas organisations. The programme aims to promote research of an international standard and the development of superior human resources equipped with the knowledge and skills to perform effective environmental management.

There are approximately 200 graduates of the programme, who are active mainly in research and educational institutions. There are also persons employed in environmental management and health positions in governments and private enterprises. About 80 percent of the 130 students are women. Tuition is approximately 200,000 THB per year, and roughly 90 percent of students receive full or partial scholarships. Most scholarships are paid by the government of Thailand.

The programme was founded on engineering, but aside from existing engineering courses, includes compulsory social science and environmental management courses, giving consideration to development of leadership and the restoration of research and educational activities in society. All lectures of the programme are conducted in English, and a variety of considerations are given to students and faculty who are not native English speakers. Specifically, a full-time English teacher is hired, and courses are held for three to four-week modules rather than full terms. Further, instructors are brought in from US consortium universities to take charge of the first half of courses. These instructors also co-author papers with Chulalongkorn professors and provide students with research instruction. For newly created courses, instructors from the US take responsibility for the entire length of the course.

The programme has put much effort into building partnerships. It receives funding to conduct research projects from within the university, the Thai government and private enterprises, and also conducts research with external organisations. As a result of such research and educational activities, the programme has published research results totalling approximately 100 papers as of September 2008.

The objective of the Thai government is advancement of science and technology, for which the strengthening of partnerships between educational institutions and private enterprises is essential. The programme currently has partnerships with companies in chemical manufacturing, research and development and petrochemicals, and hopes to strengthen partnerships in the future. As programme administration is largely dependent on funding from the Thai government, partnerships with the private sector are important for sustainable administration of the programme.

## **■Chulalongkorn University International Programme in Environment, Development and Sustainability**

### **1. Outline of the International Programme in Environment, Development and Sustainability**

#### **(1) Background of Establishment**

The postgraduate programme in Environment, Development and Sustainability was newly established in 2008. The programme was just recognised by the Ministry of Education, following an application process for approval of the new programme and degree. It was established based on Chulalongkorn University's policy to put focus on programmes in English and partnerships with external organisations. The programme aims to develop human talent equipped with the holistic knowledge to contribute to solutions to ever-changing global environmental problems and poverty problems. The programme is targeted at working students, and courses are held in the evenings. All lectures are conducted in English in order to allow for educational programmes to also be conducted outside of Thailand.

#### **(2) Basic Tenants on Education and Research**

Education focuses on the mutual relationships among environment, development and sustainability, while keeping in mind that environmental studies are characteristically based on a combination of humanities and sciences.

#### **(3) Numbers of Academic Staff and Students**

Academic staff: 5 instructors responsible for the programme, a few other lecturers  
Doctoral course students: 7 persons (2 international and 5 students from Thailand; of the five Thai students, four are young instructors and one is a consultant.)

#### **(4) Expenses**

Tuition: one year 14,000 THB

### **2. Image of Ideal Talent (Environmental Leader Concept)**

The programme aims to develop human resources to respond to issues of human security from the viewpoint of public policy and governance.

### **3. Educational Curriculum**

#### **(1) Outline of Educational Curriculum**

Degrees which can be obtained

- Ph.D. (for those with a master's degree): 51 credits required for graduation (15 credits in compulsory subjects, 36 credits for doctoral dissertation, one paper published at an international academic meeting)
- Ph.D. (for those enrolling directly from undergraduate studies): 72 credits required for graduation, (15 credits in compulsory courses, 9 credits in optional courses, and 48 credits for the doctoral dissertation, one paper published at an international academic meeting) (72 credits for doctoral dissertation, two papers published at international academic meetings)

## **(2) Distinguishing Characteristics of Educational Curriculum**

The programme aims to build understanding based on creative approaches to environmental changes and their effects as related to human lifestyles, from the viewpoint of both the natural and social sciences. Specifically, it focuses on climate change, its effects and socioeconomic influences. The programme covers a broad range of topics, including biodiversity, land use, coastal environmental management, water resource management, energy planning, social infrastructure, poverty eradication, environmental health, and business for environmental management and trade strategy.

## **(3) Course Subjects**

### Compulsory Courses

- Research Methods on Environment, Development and Sustainability
- Overview of Environment, Development and Sustainability
- Sustainable Resource Management
- Environment, Development and Sustainability Case Studies
- Theory and Practice of Development

Optional courses are currently under deliberation.

## **(4) Distinguishing Characteristics of Educational Methodology**

All lectures of this programme are conducted in English. The programme aims for students to acquire practical knowledge related to environment and development. For this reason, consultants who are actually involved in environment and development related projects are invited to present case studies in lectures. When lectures are conducted by persons from external organisations, the responsible professor of Chulalongkorn University participates, acting as coordinator.

Class content varies, but generally group work and student presentations are included along with lectures by instructors. Students do not often speak up in class and in many cases ask questions to professors individually after lectures.

## **(5) Course Content and Method of Assessment**

### **Example**

#### **Advanced Issues in Environment, Development and Sustainability**

Assessment: assignments 20%, term project 70%, participation 10%

Course content:

- Overview of advanced issues in environment, development and sustainability
- Global sustainable development governance: responses to global environmental changes
- Globalisation, regional and national development in the context of sustainable policy
- International development: practical experiences at global and regional scales
- National development: practical experiences from the Royal Development Projects
- Economics of environment and sustainable development projects
- Environmental management and innovation strategies: EIA and SEA projects
- Participation and stakeholder involvement in environmental governance projects
- Major environmental milestones in international environmental diplomacy and the key multilateral environmental agreements (MEAs)
- The Rio Conventions
- Climate change and development projects
- Biodiversity and development projects
- Desertification and development projects
- IUCN, shaping a sustainable future
- Term project presentation



## **Development Theory and Practice**

Outline: This course aims to augment understanding related to three major topics. These are, 1) scope and methods in development studies, 2) theory of development and development approaches, and 3) development practices: major strategies used by international agencies and the prevailing trends in developing countries, particularly East Asia. Classes are made up of lectures, seminars, workshops, assignments, and preparation of class papers.

Assessment: to be discussed in class. (choices: 1) book or article review, 2) group work on comparative development approaches, 3) essay on theory and practices)

Course content:

- Introduction: scope and methods
- Development ethics and social changes
- Modernisation dependency
- Neo-liberalism
- Alternative development thinking I: sustainable development
- Alternative development thinking II: human security, human development
- Mid-term--student book reviews
  - ✧ East Asian development model, post Washington Consensus and social democracy
  - ✧ Alternative development thinking III: rights based approach
  - ✧ Seminar on comparative approaches
  - ✧ Politics of development and democracy
  - ✧ International development strategies
  - ✧ Development indicators and impact assessments
  - ✧ Student seminar

Student seminar

## **(6) Process of Curriculum Design**

Curriculum design is determined via discussions between responsible academic staff members.

## **4. Relationships with External Organisations and Communities**

At present, partnerships are conducted involving visits of guest lecturers from external organisations.

## **5. Conditions for Admission**

### **(1) Admissions Applications**

The following documents are required for admissions applications.

- application form
- TOEFL score or CU-TEP score
- two letters of recommendation

### **(2) Conditions of Admission and Evaluation Standards for Selection of Applicants**

- a bachelor's degree (in any field)
- TOEFL score of 500 or above

### **(3) International Students**

At present, there is one student from the USA and one student from the Philippines enrolled in the programme.

### **6. Paths after Graduation**

As the programme has yet to produce any graduates, career paths after graduation are undetermined. As most students are working, they hope to gain promotions in their current positions upon graduation. The university hopes to send graduates to work as policy-makers or employees of international organisations.

#### **From interviews with two current students**

**Thai student:** I am currently a lecturer in environmental education at the education faculty of Chulalongkorn University. After obtaining my doctoral degree in this programme, I hope to apply my learning to adding many environment related topics into the courses I am in charge of at the university.

**Student from the USA:** After completing graduate school at Columbia University in the USA, I found employment at a private enterprise in my country. I continued on to this programme due to my desire to become involved in development in the Asian region. I chose this programme as it is located near actual sites of development. Development studies in the USA and Europe are mainly focused on South America and Africa, but this programme allows me to actually study in the Asian region. Acquisition of up-to-date information and network-building are possible in Bangkok, which has a lot of international organisations. Less expensive tuition and living expenses as compared to the USA and Europe are also attractive points. I hope the programme is further enriched with educational resources including books, facilities and academic staff, which would make it an even better programme. I have no problem with the quality of education.

### **7. Future Issues**

There are many issues left to be addressed in this newly established programme, including student recruitment, curriculum design, securing of academic staff, and so forth. The programme plans to put efforts towards securing funding from external organisations, as scholarships are important to recruitment of students.

### **8. Summary**

This programme was established in 2008 to develop human resources to address environmental, poverty and sustainability concerns in the Asian region. It aims to provide working students with holistic knowledge on the environment, poverty and sustainability. The programme is conducted entirely in English with the objective of improvement of international talent in Thailand and the option to offer the programme in other areas of the region. Four of the current seven students are instructors at Thai universities who aim to obtain doctoral degrees to augment holistic knowledge. One of the international students aims to find employment in the development field in Asia. The programme offers high quality practical education which takes advantage of its geographical location near to numerous international organisations and environment and development related international NGOs. There are many issues left to be addressed in this newly established programme, including establishment of curriculum, and securing of academic staff and students. Acquisition of external funding is essential for the maintenance of high quality educational activities and students.

## Appendices

### 1. List of Interview Subjects

Name	Position
Sangchan Limjirakan	Director, Environment, Development and Sustainability Programme, Graduate School
Dr. Charles B. Mehl	Assistant for International Matters, Under Royal Patronage
Asst. Prof. Manaskorn Rachakornkji	Postgraduate Programme Director, International Postgraduate Programme in Environmental Management
Dr. Chantra Tongcumpou	Deputy Director, International Postgraduate Programmes in Environmental Management
Dr. Dawan Wiwattanadate	Associate Professor, Deputy Director for Administrative Affairs, Energy Research Institute

### 2. List of Reference Materials

- “Executive Report: Framework of the Second 15-Year Long Range plan on Higher Education of Thailand”*, Commission on Higher Education, Ministry of Education
- International Postgraduate Programs in Environmental Management: Brochure*, Chulalongkorn University
- Natural Research Center for Environmental and Hazardous Waste Management: Brochure*, Chulalongkorn University
- “Profile of S&T Centres of Excellence Under S&T Post graduate Education and Research Development Office (PEDO)”*, Commission on Higher Education, Ministry of Education
- Postgraduate Programs in Environmental Management (Hazardous Waste Management): Brochure*, Chulalongkorn University
- “Study in Thailand 2006-2007”*, Commission on Higher Education, Ministry of Education

#### Websites:

- Embassy of Japan in Thailand, “Information on Thailand, No. 7, Education, Culture and Society” <http://www.th.emb-japan.go.jp/jp/thailand/index.htm> (accessed: 12 March 2009)
- Ministry of Foreign Affairs, “School Information on Various Countries, Thailand” [http://www.mofa.go.jp/Mofaj/toko/world\\_school/01asia/infoC10600.html](http://www.mofa.go.jp/Mofaj/toko/world_school/01asia/infoC10600.html) (accessed: 12 March 2009)
- National Institution for Youth Education, “Southeast Asian Youth, Philippines, Singapore, Thailand” (2005 International Exchange Projects Report) (2006) [http://www.niye.go.jp/houkoku\\_srch/chosa\\_cts.php?insid=12](http://www.niye.go.jp/houkoku_srch/chosa_cts.php?insid=12) (accessed: 12 March 2009)

## Reference

### Interview Questions

#### **1. Specific image(s) for the environmental leaders**

- Do you have any concrete image(s) of Environmental Leaders?
- What kind of factors do you think Environmental leaders should have?
- What kind of educational programs are necessary (how does education contribute) to equip students with suitable abilities for environmental leaders? How do you introduce such education into the program?
- Is there any distinction between ‘leaders’ and ‘environmental leaders’?

#### **2. About the entrance requirements**

- Is there any criterion to evaluate students’ abilities such as cross-cutting thinking and applied skills of professional skills in the entrance selection?
- Does your program make consideration for students (students entering from the workforce)?
- Could you give us some concrete examples of evaluation standards for entrance requirement?
- How do you recruit international students from abroad?

#### **3. About the programs**

- What are the reasons for establishing the courses related to environmental studies?
- What areas of study is the centerpiece of your program: i.e. 1) Arts and humanities studies such as law and economics, 2) science studies such as engineering and natural science, or 3) interdisciplinary area such as “environmental studies”?
- Do you have detailed information on curriculum and syllabus?
- What kind of advantages can students obtain through this program?
- Leadership needs not only knowledge but also human skills (networking, discussion and presentation). In your university’s program, are there any education methods which focus on improving the later?
- Does your university have external funds to operate the program? If so, how did you receive them?

#### **4. Specific methods for networking with other organizations/institutions**

- Do you have any collaborative activities or partnership with other universities, companies, NGOs, and/or international organizations within the program?
- If you do, how do you develop such partnerships?

#### **5. Relationship with the local communities/municipalities**

- Are there any relationships or references to the environmental policy of the local areas and this program?

#### **6. About the graduates of the program**

- What kind of career opportunities do graduates have?
- If there is any network among graduates, could you tell me how to build the network?