

# **Master's Program in Environmental Sciences**

## **2014 Revised Guideline for**

### **Sustainability Science, Technology, and Policy Program (SUSTEP)**

#### ***BACKGROUND & CONCEPTS***

The increasing demand for food, water, energy, and land has caused large-scale environmental degradation worldwide. The developing world is especially vulnerable to these debilitating consequences. Higher education and R&D are vital in mitigating environmental problems through the creation, dissemination and application of innovations for the sustainable world. Considering these urgent needs, the University of Tsukuba has launched the Sustainability Science, Technology, and Policy Program (SUSTEP) to foster global leaders, who are highly trained in science/technology, humanity/social sciences, and diplomacy/leadership. While societies face different challenges to overcome, effective education for nourishing prospective global leaders is the first step. In this regard, the University of Tsukuba has offered the Environmental Diplomatic Leader (EDL) Program and the Waste Management Expert Course (G30 Program) since 2009. Through running these programs, the Master's Program in Environmental Sciences and the Doctoral Program in Sustainable Environmental Studies have acquired valuable experiences and insights that are essential in producing promising global leaders. By incorporating all of our past experiences and insights, SUSTEP has merged the EDL and G30 programs and go beyond them by offering an innovative and practical education system that promotes sustainable human resource development in the world, particularly in Asia, Africa and Latin America.

#### **SUSTEP under the Master's Degree Program**

SUSTEP is a certificate program, which is administered by the Master's Program in Environmental Sciences and the Doctoral Program in Sustainable Environmental Studies. It is designed for educating both Japanese and international students. Successful students will earn a SUSTEP certificate along with their master's degree. All students, who are admitted to the master's program at the University of Tsukuba or an officially affiliated university, are eligible to apply for this certificate program.

#### **Implementation Pillars in SUSTEP**

- Strong research skill in knowledge acquisition;
- Increased intellectual capacity and awareness of global and local issues;
- Enhanced curriculum for global leaders education;
- Multinational cooperation and brainstorming.

#### **Innovative Curriculum:**

##### **SUSTEP—**

- Offers courses on advanced technologies, sciences and policies for sustainability;
- Provides research supervision through the academic committee system
- Offers field studies in Japan and abroad;
- Provides the opportunity to work for an international research project that is led by our faculty members;
- Offers rigorous training in four major areas;
- Fosters interdisciplinary knowledge and skills that are necessary to solve complex sustainability issues.

## **Requirements**

In order to receive a SUSTEP certificate, all students must meet the following six criteria:

- Take at least one course from the major of Environmental Policy and Planning (EPP);
- Earn 5 credits or more from designated courses in one of SUSTEP's majors;
- Take either International Field Appraisal or Environmental Field Appraisal;
- At the time of graduation, have 30 credits or more from English courses;
- Complete master's thesis in English;
- Master's thesis must be related to SUSTEP concepts.

## **Requirements to obtain a Master's Degree in Environmental Sciences**

- Complete 18 credits from compulsory courses;
- Complete at least 12 credits from specialized courses;
- Credits taken from other master's programs can be regarded as part of specialized courses (up to 10 credits) as long as course contents are necessary for the completion of master's thesis.
- Make interim and final thesis presentations and pass a thesis defense.

## Four SUSTEP Majors

In order to refine expertise and specialized practical skills, SUSTEP offers students the opportunity to choose the following “Majors.” Successful recipients of SUSTEP certificates will receive special recognition regarding their major field.

### 1. Environmental Hydrology and Disaster Prevention in Climate Change (E-HyDIP-CC)

The hydrological cycle is the principal component in the global environment and life. Also, natural disasters profoundly affect human life in a variety of regions on earth. Both phenomena are relevant climate change issues. Therefore, we have to understand the interaction between hydrological phenomena and natural disasters that are influenced by climate change. Particularly, we focus on the surface water and groundwater cycle system, contamination processes in the surface water/groundwater continuum system, water source/age/profile information in relation to climate and ecosystems. In environmental disaster prevention, we focus on natural disasters of earthquake, landslide, debris flow and flooding while considering hydrology. In this major, we would like to foster global leaders who have a scientific and technological understanding of the factors mentioned above and who gain a comprehensive understanding of environmental policy, ethics, regional culture, and traditional wisdom. Students are expected to make important contributions to maintaining a sustainable and safe water environment, disaster prevention and climate system.

### Elective Courses Available for This Major

Code	Class	Credit	Term	Professor
01AD301	Introduction to Water Environment	2	Fall AB	Tsujimura
01AD302	Integrated Water Science and Technology	2	Fall AB	Fukushima, Tsujimura
01AD592	Prevention and mitigation of sediment disaster	2	Fall AB	Hotta, Mizuno
01AD316	Climate System Study I	1	Spring AB	Ueda
01AD315	Climate System Study II	1	Spring AB	Tanaka

## **2. Ecosystem and Biodiversity Conservation and Remediation (EBCR)**

It is not disputable that ecosystem and biodiversity protection, rehabilitation, and restoration are urgently needed. In response to human-induced and natural disturbances such as air and water pollution, deforestation and natural disasters, animals, plants, and microorganisms have developed their survival abilities through defense mechanisms and remediate environments, which may contain breakthrough ideas to solve interlocked problems. To learn the basic mechanisms of ecosystems together with soil science, microbiology, and analytical chemistry will help students foster analytical methods and skills and enhance their ability to create innovative measures to mitigate complicated environmental issues.

### **Elective Courses Available for this Major**

Code	Class	Credit	Term	Professor
01AD411	Terrestrial Ecology	2	Fall AB	Hirota
01AD303	Ecological Soil Resources	2	Intensive	Tamura
01AD305	Environmental Microbiology	2	Fall AB	Nomura, Toyofuku
01AD318	Vegetation Science	1	Fall A	Kamijo et al
01AD605	Environmental Health perspective	2	Spring AB	Kumagai, Shinkai

## **3. Integrated Resource and Waste Management (IRWM)**

Decoupling economic growth from environmental pressure and resource over consumption is one of the greatest challenges of our time. If we add the socio-economic disparities, between and within countries, the challenge becomes even more complicated. In recent decades, Asian countries have enjoyed a sustained period of rapid economic growth. However, this economic growth has been accompanied by extensive and inefficient use of natural resources, environmental degradation, and urban–rural socio-economic disparities. The Integrated Resource and Waste Management (IRWM) Major offers a set of intensive courses for students who wish to acquire advanced knowledge about best available technologies and management systems that control and reduce the generation of waste through the whole product and system lifecycle. It also focuses on adaptive control approaches that improve such system performance. This Major also provides students with advanced professional and technical knowledge in the management of environmental risk, including the risk of toxic wastes to human health and the management of e-waste. The seminar courses for Master's Thesis include weekly presentations and discussions about research progress. Each student will be supervised by an academic committee, which consists of academic advisory committee members and one supervisor.

### Elective Courses Available for This Major

Code	Class	Credit	Term	Professor
01AD311	Introduction to Waste Management	2	Spring AB	Yabar
01AD312	Solid Waste Management Systems Planning	2	Fall AB	Yabar
01AD307	Utilization and Recycling of Bio-resources	2	Fall AB	Zhang, Utsumi, Lei
01AD222	Soil and Water Environment Colloid Science	2	Intensive	Adachi

### 4. Environmental Policy and Planning (EPP)

Environmental conservation and economic development are in a trade-off relationship. This trade-off can be improved by striking a better balance between higher economic development and updated environmental bench marks. This major aims to foster experts who are able to: (1) identify socio-economic and ecological factors behind environmental problems; (2) profile the structure and mechanism of trade-off; (3) identify suitable and adaptable environmental remediation technologies and policies in order to control the environment and natural resources; and (4) construct a comprehensive environmental plan. Main topics of interests are environmental economics, environmental leadership, ethics, geography, urban planning, and policy science. Graduates are expected to be active in various fields related with environmental issues as policy makers and planners.

### Elective Courses Available for this Major

Code	Class	Credit	Term	Professor
01AD601	Applied Environmental Ethics	2	Fall AB	Matsui
01AD310	Environmental Policy Appraisal	2	Fall AB	Higano
01AD317	Introduction to Environmental Policy	1	Fall AB	Kaida
01AD430	Environmental Law	2	Intensive	
01AD607	Policy and Planning for Forest Conservation	2	Fall AB	Masuda
01AD600	Landscape Planning	1	Fall AB	Murakami
01AD603	Spatial Information Engineering in Environmental Science	1	Fall AB	Yoshino
01AD614	Simulation of Environmental Policy	2	Spring AB	Mizunoya