# Major in Environmental System Management

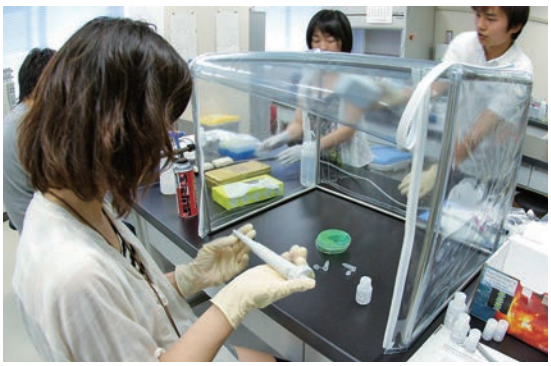
Learning objectives

## Educate people who will develop systems that secure the quality and quantity of natural resources

Population increase and expansion of human activity is giving rise to global warming and many other environmental issues on our planet. To resolve these issues, concurrent understanding of humanity and natural ecology systems is indispensable. The key to bringing about this understanding is a cross-disciplinary integration of social sciences, engineering and physical science into a symbiotic systems science, and the creation of a management science based on this symbiotic study. We are developing human resources who are versed in these pursuits.

## Points

- **We prepare a curriculum that centers on circulating natural resources drawing from the physical science, engineering and social science fields.**
- **Students learn amongst abundant natural resources in Fukushima, through practical fieldwork on natural resource purification, security and management planning.**
- **We prioritize building a global career for our students through internships and overseas practicum programs, starting with domestic and overseas environmental surveys.**



## Ideal student

- Has a strong interest in environmental symbiosis systems science between humans, industry and nature.
- Will be instrumental in securing and maintaining natural resources starting with water.

## Pathways after graduation

- Environmental management
- Water purification and soil remediation related companies
- Environmental surveyor
- Water and environment related public service in national and regional governments
- Teaching in science, IT, technology and manufacturing related areas

## Student's Voice

### Water as an indispensable resource is my topic. The significance of my research was highlighted by the earthquake disaster.

Fourth Year Environmental System Management Student
**Shoma Ryuzaki**
(Shoshi High School)

I think the best feature of this faculty is that it allows you to take your time in choosing your major after starting your studies, so that you can learn about the field that most interests you. I chose the science pathway from high school and had my heart set on science for university study but I could not pinpoint what I wanted to study for my next step at university. Learning widely in the first year course and listening to lectures by my teachers, I began to be interested in water as a topic. Water is indispensable to humans, while also being a threat in the form of large waves, typhoons and floods. There are professors studying water from a variety of angles, which made it difficult for me to decide, but in the end I chose the topic of flood damage.

My hometown, Koriyama City, has suffered frequent flood damage from rainfall. I am working out how many years there are between floods to analyze frequency, and referencing river water volume data from the Ministry of Land, Infrastructure, Tourism and Transport to construct a program and draft a risk map. Experiencing the Great East Japan Earthquake and watching the endless broadcasting of tsunami and flood footage reaffirmed the significance of this research topic. There are many discoveries in researching your hometown and I truly hope that my research will prove useful in preventing future disasters.

Second Year Second Semester Timetable

| | Mon | Tue | Wed | Thu | Fri |
|---|---|---|---|---|---|
| 1 | English B Ⅰ | Overview of Soil Purification | Overview of Ecology | Overview of Groundwater Basin Management | Analysis Ⅱ |
| 2 | Overview of Inorganic Chemistry | | English B Ⅱ | Topology | Instrumental Analysis |
| 3 | Biochemical Engineering | Environmental Conservation Theory | | Global Environmental Science Experiment | Environmental Analysis Experiment |
| 4 | Water Quality Conservation Improvement Theory | Overview of Chemical Engineering Theory | | Global Environmental Science Experiment | Environmental Analysis Experiment |
| 5 | International Relations Theory | | | Global Environmental Science Experiment | Environmental Analysis Experiment |

# Systematic learning on recycling or circulating natural resources

- Introduction to Ecology

- Overview of Water Circulation Systems
- Overview of Water Quality Conservation Improvement
- Overview of Water Catchment Management and Planning
- Overview of Analytical Chemistry
- Overview of Organic Chemistry
- Overview of Geology
- Overview of Atmospheric Environmental Science
- Overview of Regional Planning

- Overview of Inorganic Chemistry
- Overview of Groundwater Basin Management
- Overview of Soil Remediation Chemistry
- Overview of Biodiversity
- Overview of Ecology

- Environmental Planning Theory
- Environmental Conservation Theory
- Living Environment Theory
- Regional Planning Theory

- Chemical Bonding Theory
- Water Catchment Management and Planning Theory

- Forest Survey Methods
- Natural Environment Survey Methods
- Groundwater Basin Management Survey Methods
- Global Environment Survey Methods

- Catchment Water Circulation Systems Survey Practice
- Biodiversity Conservation Practice

- Conservation Biology Experiment
- Soil Remediation Chemistry Experiment
- Environmental Analysis Experiment
- Global Environment Science Experiment
- Water Quality Conservation Improvement Experiment

- Environmental Analysis Practice
- Environmental Modeling Practice
- Global Environment Planning Practice

- Environmental Monitoring
- Instrumental Analysis
- Environmental Modeling
- Environmental Catalytic Chemistry
- Water Circulation Systems
- Forest Ecology
- Matter Separation Chemistry
- Satellite Data Analysis

## Example of the Courses

### Research on conservation and management of groundwater

Groundwater resources are precious water resources that are indispensable to the future of human activity and survival. In order to sustainably and effectively utilize groundwater, we need to clearly understand the structure and features of the groundwater basin, which acts as a container for groundwater, and understand groundwater flows and water quality. Domestically, we are engaged in research on the overexploitation of groundwater leading to drying springs, subsidence and groundwater salination.
Overseas, we are identifying the mechanisms of arsenic pollution in the groundwater in the Mekong Delta and researching appropriate groundwater development and management in developing countries. We utilize site monitoring and simulation models in our research.

## Example of the Courses

### Research on media and education regarding environmental issues

From a firm basis in system thinking that can be applied across various environmental issues, we are researching systematic approaches. In recent years, we have been engaged in the development of indices that facilitate the understanding of environmental information, the analysis of media attributes, and the development of educational materials relating to the environment. After the accident at the TEPCO's Fukushima Daiichi Nuclear Power Plant, we have started to seriously engage with the myth of nuclear power plant safety. This type of *no clear thought vector* that had permeated the Japanese populous impairs the ability of citizens to judge aptly and fairly.
Our research aims to verify causes for this from the perspective of environmental education and environmental media. We have also compiled *A supplementary reader for thinking about radiation and exposure* as a lesson to future generations.


## Example of the Courses

### Research on regional insect fauna and its origins

Insects are the most successful biome on earth and one of the most familiar creatures to us all. There are a known group of insects that can tell us about the condition of the natural environment in a specific location by studying its distribution and species composition. In our lab, we are contemplating how humans and the natural environment can exist symbiotically. Specifically, we find out which insects are in which location and examine which environmental factors are affecting the distribution and species composition. We conduct fieldwork in rivers, lakes, marshes, mountains and forests where we collect samples and survey the environment, and make specimens and microscope observations back at the lab, to clarify the causal factors of the local insect fauna.

## Example of the Courses

### Research on organic synthesis that considers environmental impact

Our lab is researching synthesis and reactions of non-benzenoid aromatic compounds and their spectroscopic properties. Our research subject, Azulenes and 1-Azaazulenes are known to have subtypes that are pharmacologically active with anti-allergenic properties or contain oxidation-reduction coenzymes, and are a quite interesting group of compounds. Most coenzymes that are responsible for vital reactions are nitrogen-containing heterocycles. Currently we have focused our research subject to flavin adenine dinucleotide (FAD) model compound synthesis and its reactivity, and are investigating *in vivo* reaction simulation. FADs are responsible for redox reactions within the body and we are aiming to develop catalytic organic synthesis reactions using this attribute.

## Example of the Courses

### Forest ecology research

With forest ecology as a starting point, our research especially utilizes dendrochronology to elucidate forest dynamics and looks at applications of tree rings in various fields. Tree rings record a variety of environmental information over a span of decades or centuries, allowing us to research environmental shifts and the history of forest formation and decline over a relatively long timescale. Dendrochronology is useful in dating disasters and human activity with a high level of accuracy. Therefore we engage in interdisciplinary collaborations with people in different fields such as geologists and archaeologists in analyzing excavated timber from archaeological sites and submerged forests. We are also engaged in long-term continuous surveys in the field, such as research into the impact of feeding damage by deer on vegetation in Oze.

## Example of the Courses

### Research on the history of large-scale explosive volcanic eruption and its prediction

The large-scale explosive volcanic eruptions in southern Kyushu in the Paleolithic era and the Jomon era covered nearly all of Japan under a few centimeters of tephra (volcanic ash). Such catastrophic eruptions are not frequent, but when they occur, they cause enormous damage. We are geologically researching the frequency and scale and location of volcanic eruptions by studying lithofacies, stratigraphy, distribution and petrochemical qualities of pyroclastic flow deposits and tephra layers. In order to clarify these items in detail, our research is not limited to land, but also extends to tephra layers sandwiched between lake deposits or marine sediments.