Zurich University
of Applied Sciences

Life Sciences and Facility Management

Institute of
Natural Resources Sciences

Come to Switzerland

Master of Science in Natural Resource Sciences
Zurich University of Applied Sciences
Institute of Natural Resource Sciences in Wädenswil

Courses taught in English
Spring Semester 2019

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Zürcher Fachhochschule

Contact

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Master description

Careful land use and a sustainable economy are the key societal challenges of the coming decades. How can we bring about change that leads to sustainable development? Which strategies, methods and conditions will make this transition possible? These questions form the starting point for the interdisciplinary and transdisciplinary Master‘s programm ENR.

Practical and research-oriented: The majority of the research and services projects at the Institute of Natural Resource Sciences are carried out in cooperation with national and international partners from industry and research. As part of the studies programm, the students will work on research questions together with the Institute‘s research groups and they will have contact with companies, research institutes and public institutions. As part of the teaching, external lecturers ensure that there is a connection with the practice and allow the students to develop professional networks.

International: As part of the Master‘s programm ENR, students have the opportunity to reach the Double Degree with the University of Ljubljana. This specific programm allows eligible students to obtain the Master‘s degree from both institutions. The programme’s duration is two years (120 ECTS), divided in one year (60 ECTS) at the home institution, one semester (30 ECTS) at the host institution and one semester for the Master’s thesis (30 ECTS) in which both institutions are involved. Student’s selection happens through a call for application, which each institution issues before the end of the first semester of the current Master’s programm for students to be included in the double degree programm in the the following academic year. (i.e: Students beginning in autum 2018 , do they DD semester on Autum 2019 or Spring 2020)

Courses

The Institute of Natural Resources offer a wide range of courses and tutorials taught in English in the **spring semester** each year. Exchange and Double Degree students can choose their courses from different module categories depending on their topic of interest (Research Methods, Topic Focus, Environment-Society-Responsibility or Master Studio and Thesis) and Topic Focus. Three Master’s Research Units (MRU) help to define the Topic Focus. If Agrofood Systems, Biodiversity & Ecosystems and Ecological Engineering the student has the choice. Diverse and modern teaching methods make the lessons interesting and enjoyable.

Links

More information about the master ENR:
Courses: www.zhaw.ch/en/lsfm/study/master-of-science-in-environment-and-natural-resources/study-contents/
Schedules: www.zhaw.ch/en/lsfm/study/master-of-science-in-environment-and-natural-resources/organising-your-studies/
Double degree: www.zhaw.ch/iunr/master/en/
Summer School: www.zhaw.ch/en/lsfm/study/international/exchange-options

Advanced Life Cycle Assessment and Ecodesign (3 ECTS)

Admission criteria

Students should be able to...

- explain the drivers, mechanisms and impacts of major environmental issues such as climate change, eutrophication, resource depletion, deforestation etc.
- elaborate on the sustainable development goals of the United Nations
- read, process and critically discuss scientific publications from peer-reviewed journals in English language
- understand the basics of systems theory, life cycle assessment, as well as chemistry

Learning outcomes

Students will learn...

- systemic life cycle thinking as well as analysis of processes in complex value chains
- to quantify and assess sustainability impacts using advanced life cycle based approaches such as consequential Life Cycle Assessment (LCA)
- to justify methodological choices and assumptions, e.g. the choice of consequential LCA instead of attributional LCA or the use of regionalised inventory models and impact assessment methods
- to rate the uncertainty of their results based on the underlying data and assumptions
- to conduct an advanced LCA project using LCA software
- to design innovative sustainability solutions from cradle to grave

Contact: matthias.stucki@zhaw.ch

Agriculture for the Future (3 ECTS)

Admission criteria

Students should be able to...

- describe the concept of „good agricultural practice“ and transfer this to practical examples (plant protection, biodiversity, nutrient cycling, resource conservation, etc.).
- present individual strategies that contribute to the improvement of the environmental sustainability of agricultural systems.
- identify sustainability conflicts within the food value chain and design solutions with a view to sustainable production and supply chains.
- define the requirements for a sustainable food system in terms of food security, rural development and conservation of resources, and analyse trends, relationships and trade-offs, as well as their political, economic and environmental drivers and instruments.

Learning outcomes

Students will learn to...

- anticipate the factors and conditions which affect the design of sustainable agricultural systems.
- design and evaluate specific scenarios for the development of future agriculture in an international environment.
- independently develop future models for agricultural systems based on scientific studies and recognised methods, and estimate the effect of these models on all dimensions of sustainability.

Contact: johannes.fahrentrapp@zhaw.ch

Aquaculture Systems (3 ECTS)

Admission criteria

Students should be able to...

- design, construct, manage and operate examples of complex biological/ecological circulatory systems.
- analyse and model interactions between the technical equipment in such systems and higher organisms/microorganisms.
- name the most important laws of physics, chemical reactions and (micro) biological processes in aquatic environments.

Learning outcomes

Students will learn to...

- discuss the latest drivers, challenges and opportunities of various forms of aquaculture and aquaponics at regional and global levels.
- differentiate between various aquaculture systems (including aquaponics) and identify their characteristics.
- understand and quantitatively evaluate an aquaculture (aquaponic) system concept.
- explain the most important factors for animal welfare (fish, crabs) and how to take them into account.

Contact: dominik.refardt@zhaw.ch

Behavioural Change (3 ECTS)

Admission criteria

Students should be able to...

- name fundamental upstream factors (e.g. attitudes, knowledge and values) and describe their basic principles. If a student does not possess the basic knowledge required, literature for self-study will be recommended.
- name examples from their professional or daily life, in which behavioural changes play a role.
- apply empirical research methods.

Learning outcomes

Students will learn to...

- characterise, classify and differentiate between various approaches to behavioural change (e.g. structurally, situationally and personally focused approaches). They will be able to explain why classical Behavioural Change (BC) intervention approaches, such as information campaigns, often fail to achieve their desired goals and what the fundamental ideas are which form the basis for newer, situational approaches like nudging.
- understand which psychological variables (e.g. creating attention, imparting knowledge, increasing self-efficacy, developing intentions) can influence behaviour and where the limits of this influence are (e.g. habits and habituation, ethical aspects).
- select BC intervention approaches depending on the context and conditions of the intended change in behaviour.
- determine and analyse the target group of a BC intervention (e.g. sociodemographic, psychographic characteristics).
- design and carry out several appropriate BC interventions for different target groups and know what should be considered in the implementation of such interventions (e.g. cost-benefit ratio).
- evaluate and optimise energy concepts based on systems engineering, ecological and economic criteria.

Contact: linda.miesler@zhaw.ch

CO2 Management in Companies and Local Authorities (3 ECTS)

Admission criteria

Students should be able to...

- explain the greenhouse effect
- understand the causes and effects of climate change
- recognise the greenhouse gases and their respective global warming potential (GWP)

Learning outcomes

Students will learn to...

- How to set up a CO2 management system for companies and local authorities in accordance with international standards (GHG Protocol Standard)
- How to operate a CO2 management system for companies and local authorities
- How to define science-based targets for CO2 management systems
- To assess the value of CO2 management for a company and a local authority

Contact: juerg.rohrer@zhaw.ch

Environmental Economics (3 ECTS)

Admission criteria

Students should be able to...

- explain the basic principles and workings of the market economy and the interactions between business, politics, law and technology, as well as demonstrate the interrelationships between the economy and the natural environment.
- evaluate the potential and limitations of selected approaches to economic valuation methods, as well as explain and name concrete examples of these approaches.
- apply models and methods from resource economics and interpret relevant scientific studies.
- take a critical stand on political and social discussions concerning objectives and actions designed to promote sustainable development (Agenda 2030, Paris Agreement, etc.).

Learning outcomes

Students will learn to...

- assess the main economic theories of economic and social development in terms of their current relevance, derive conclusions from this understanding and make recommendations for sustainable development policy.
- identify and analyse environmentally and socially counterproductive policy strategies (e.g. „policy of cheap centralised resources“,“ asymmetric globalisation „) and concretely demonstrate how environmental and social issues can be integrated into the market economy („eco-social market economy“), companies (eco-design, new business models, businesses of the future), economic policy and the world economy.
- competently comment on the latest developments and discussions in the field of Environmental Economics / Ecological Economics and formulate conclusions for their own further work (e.g. „prosperity without growth“, „resource-light lifestyles and business models“, „new approach to time, time sharing services and time prosperity“, „Corporation 2020“).

Contact: juerg.minsch@zhaw.ch

Environmental Ethics (3 ECTS)

Admission criteria

Students should be able to...

- recognise the current environment and landscape as a dynamic image of historical changes.
- explain the impact of anthropogenic activities on the environment and discuss cultural and socio-economic consequences.
- understand „sustainable development“ concepts and their main resulting problems, link them coherently together and connect them to current negotiations and measures in place at local, national and international levels.

Learning outcomes

Students will learn to...

- perceive and critically reflect on projects in their field, as well as current issues and debates on ethical dimensions and ways of thinking.
- apply methods for the ethical assessment of complex issues in the relationships between humans, the environment and society.
- recognise their responsibility for societal challenges and perceive these challenges in their personal environment.

Contact: petra.hodgson@zhaw.ch

Natural Resource Management in Emerging Economies (3 ETCS)

Admission criteria

Students should be able to...

- justify global conflicts in terms of resource use and evaluate different solutions.
- apply models and methods from resource economics and interpret relevant scientific studies.
- take a critical stand on political and social discussions concerning objectives and actions that support sustainable development (Agenda 2030, Paris Agreement, etc.).

Learning outcomes

Students will learn to...

- establish the positive and negative effects of existing natural resources on the development of a country, considering various theories of development (Development Economics), and analyse the various causes (e.g. natural resource curse).
- analyse and critically evaluate instruments and governance approaches to sustainable development and resource use in developing and emerging countries.
- situate and critically evaluate the role of international cooperation and its actors and forms in the context of natural resources.

Contact: frank.wittmann@zhaw.ch

Natural Resource Management in Mountain Areas (3 ECTS)

Admission criteria

Students should be able to...

- theoretically derive, apply and reflect on the concept of sustainability, as well as mediate and implement solution-oriented approaches to specific development processes.
- theoretically derive basic, natural and social science knowledge about regions in mountain areas.
- reflect on and abstract knowledge from past experiences of concrete development projects, then adapt and transfer this knowledge to other regions.
- develop communication and participation methods, then adapt and apply them to different problems.

Learning outcomes

Students will learn to...

- analyse the transdisciplinary relationships between resource management in mountain areas and their impact on society, and incorporate them into solution-oriented, creative concepts and implementation activities.
- elucidate scientific discourse on the management of natural resources in mountain areas, including political, economic and environmental factors, and understand the different points of view.
- classify and evaluate various existing development tools and apply them to practical and /or regionally focused issues.
- evaluate scientific methods, develop individual approaches and apply them in concrete examples (research projects, regional development projects).

Contact: stefan.forster@zhaw.ch

Natural Resource Management in Urban Areas (3 ECTS)

Admission criteria

Students should be able to...

- interpret the city as a complex ecosystem as well as understand and evaluate abiotic, biotic and human-ecological subsystems and their interactions.
- identify challenges of urban areas (resource scarcity, food systems, biodiversity, climate change) and explain solutions for their sustainable development and use.
- apply models and methods of resource economics and interpret appropriate scientific studies.
- present in a differentiated way what urban ecosystems provide for people.

Learning outcomes

Students will learn to...

- analyse the requirements, influencing factors and goal conflicts of a sustainable management of urban habitats.
- examine concepts, instruments and measures (Smart City, Urban Ecology, Green Building, Sustainable Urban Food Systems) to increase urban ecosystem services, i.e. to increase the quality of life while simultaneously reducing the consumption of resources, and to assess them critically regarding social, economic and environmental compatibility.
- plan, implement and evaluate selected management concepts from the fields of urban development, ecosystems, biodiversity, waste, water, soil, energy, air and culture to improve the living and environmental situation in urban areas.
- apply the concept of ecosystem services to issues in urban habitats.

Contact: vicente.carabias@zhaw.ch

Patterns and Trends in Environmental Data (3 ECTS)

Admission criteria

Students should be able to...

- assess the suitability of, select and combine, different theoretical and empirical research methods for a given problem.
- critically assess and validate the results from theoretical and empirical methods.
- analyse data using descriptive and inferential statistics with the aid of specific statistics software.

Learning outcomes

Students will learn...

- to define interesting patterns and trends for their own datasets and how to write scripts to search for these patterns and trends.
- how to employ third-party data processing tools for their own data and how to solve any programming problems with assistance from the Internet community.
- to document identified patterns and trends and critically discuss processes in order to gain a better understanding.
- to use the statistics and visualisation platform R as an efficient and effective interface to other software applications used in the field of Natural Resources (spreadsheets, geographic information systems (GIS), modelling applications, visualisation environments).

Contact: patrick.laube@zhaw.ch

Project work in Research Unit 1 (6 ECTS)

Admission criteria

Students should be able to....

- articulate the main questions, positions, schools of thought and research methods of their subject area

Learning outcomes

Students will learn to...

- clearly communicate in-depth technical knowledge in writing and oral presentations.
- analyse and process develop their specialist knowledge.
- derive and formulate concrete questions from a comprehensive analysis of a problem.
- use questions they develop to create a realistic project plan for a project proposal.
- be responsible for independently planning and organising a research project

Contact: daniela.harlinghausen@zhaw.ch

Project work in Research Unit 2 (6 ECTS)

Admission criteria

Students should be able to...

- explain and competently present the knowledge acquired in Tutorial 1.
- explain the specific research methods and commonly used project management tools from the Research Methods module.

Learning outcomes

Students will learn to...

- critically question and apply the specific methods learnt in the Research and Methods module.
- perform in-depth analysis of the technical knowledge acquired in Tutorial 1.
- implement solutions to specific topic-related issues and plan, organise and independently run a small project using common project management tools (milestones, deliverables, PERT and Gantt charts).
- analyse and present project results, as well as assume project management responsibilities.

Contact: daniela.harlinghausen@zhaw.ch

Remote Sensing for Ecology (3 ECTS)

Admission criteria

Students should be able to...

- explain the basic functions and interrelationships in ecosystems.
- perform simple, stand-alone field recordings in ecosystems.
- explain the theoretical foundations of Geographic Information Systems (GIS).
- carry out basic, spatial ecosystem analyses using GIS.

Learning outcomes

Students will learn to...

- recognise and evaluate the potential of remote sensing for ecosystem assessment and evaluation.
- perform spatio-temporal data and analyses by means of remote sensing (e.g. drone) and GIS.
- interpret and critically assess remote sensing data and products for ecosystem assessment and evaluation.
- integrate remote sensing data and products into their own research or practical projects and carry out such a project.

Contact: michael.doering@zhaw.ch

Summer School Geography of Food (4 ECTS)

Admission criteria

Students should be able to…

- independently develop a project idea and apply empirical research methods such as literature review, qualitative survey, data analysis and interpretation
- quickly adapt to new environments and settings and work in international teams of students on topics related to agronomy, food industry, environment and rural development
- recognise the complexity and challenges of global food systems and value chains and critically assess alternative strategies for more sustainable solutions

Learning outcomes

Students will learn to…

- critically assess the sustainability of food systems and food value chains in the environmental, social and economic dimension
- adapt food value chains to help achieve the sustainable development goals (SDGs) of the Agenda 2030
- develop a project idea to tackle local challenges in the context of sustainable food value chains and the SDG 15 (Life on Land), conduct a mini case study, create a scientific poster and present it to an international audience
- identify the drivers of the current food system and its impact on the environment, politics, society and economy
- apply methods to develop and implement new solutions for sustainable food chains in international teams of students and supervisors with various backgrounds

Contact: isabel.jaisli@zhaw.ch

Summer School Biodiversity Monitoring in Alpine Environments (4 ECTS)

Admission criteria

Students should be able to…

- understand how various environmental drivers impact biodiversity and lead to unequal distribution of biodiversity in space and time;
- recognize species of various plant and animal groups and use scientific determination keys; and
- apply the software R effectively to manipulate data and conduct descriptive and inferential statistical analyses.

Learning outcomes

Students will learn to…

- determine plant, invertebrate and vertebrate species of the Swiss Alps;
- develop and perform sampling and monitoring schemes for different components of biodiversity along ecological gradients and across spatial scales to identify drivers of change;
- analyse various types of biodiversity data with adequate statistical methods;
- connect their findings to in-situ measured abiotic data, remote sensing data and information on socioeconomic drivers; and
- write up the outcomes of a research project conducted in a smaller group according to the standards of international scientific journals.

Contact: juergen.dengler@zhaw.ch

Summer School Decentralised Sanitation, Recycling and Sustainability (4 ECTS)

Admision criteria

Students should be able to…

- explain & interpret the parameters commonly found on standard wastewater data sheets (e.g., COD, BOD, TOC, DOC, TSS, TN, NH4-N, NO3-N, TP, ortho-P)
- perform back-of-the-envelope calculations on pollutant loads
- discuss the pros and cons of decentralized and centralized sanitation
- take a critical stand in political discussion on sustainability in water-related issues

Learning outcomes

Students will learn to...

- design and explain concepts for ecological water management in water-scarce areas
- describe and evaluate the performance of decentralized wastewater treatment systems and ecological sanitation methods
- conceptualize steps towards the practical implementation of these systems
- discuss in detail how and why decentralized sanitation is linked to recycling and sustainability issues
- name and explain the water situation in a karstic areas (at the example of the coastal city of Piran, Slovenia)

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Writing Clinic

The courses taught in English enable students to become more competent, effective users of the English language. The Writing Clinic contributes to this by assisting students with any English language needs they have during the courses and provides help with writing in English. In particular, students have the opportunity to improve their written texts and general writing ability in individual face-to-face sessions. Online help can also be provided.

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Welcome to Switzerland!

www.zhaw.ch/iunr/master/en