



Life Sciences and
Facility Management

Institute of
Natural Resource Sciences

Study in **Switzerland**

MSc in Environment and Natural Resources

Zurich University of Applied Sciences

Institute of Natural Resource Sciences in Wädenswil



Courses taught in English fall semester 2022



Contact

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Master's description

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

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 study programme, students will work on research questions together with the Institute's research groups, establishing contacts with companies, research institutes and public institutions. Being taught by external lecturers ensures that there is a connection to real world applications and also enables students to start developing professional networks.

Courses

The Institute of Natural Resource Sciences offers a wide range of courses and tutorials taught in English every spring semester (described in this brochure). Incoming students can choose their courses depending on their field of interest. Close links between the study programme and research teams means that the practical relevance of the content is guaranteed. Excursions, project weeks and specialisation modules supervised by external specialists complement classroom studies and allow students to work on current real-world issues. A welcoming atmosphere with friendly and helpful students, teachers and collaborators will make for a very pleasant and memorable stay. Last but not least: the programme is completely paperless!

More Information

General	www.zhaw.ch/iunr/master/en
Courses	www.zhaw.ch/iunr/master/modules
Schedules	www.zhaw.ch/iunr/master/stundenplan
Institute	www.zhaw.ch/en/lsfm/institutes-centres/iunr www.zhaw.ch/iunr/about-us



Advanced Life Cycle Assessment (3 ECTS)

The United Nations 12th Sustainable Development Goal (SDG) targets «responsible consumption and production» by reducing the ecological footprint of products and services. Scientifically valid life cycle based information is crucial to the successful implementation of sustainability strategies. The Advanced Life Cycle Assessment module focuses on the application of advanced life cycle assessment (LCA) methods that contribute to the 12th UN SDG. The module enables participants to work with life cycle based data and transfer insights from applied science to industry and society. Students will learn how to identify, develop and assess effective sustainability practices.

Focal points:

Systemic life cycle thinking

- Analysis of complex value chains
- Humankind's Planetary boundaries
- Carbon footprint of nations

Assessing sustainability impacts

- Advanced life cycle approaches
- Consequential Life Cycle Assessment

Designing sustainable solutions

- Eco-design strategies
- Sustainable Life Cycle Management
- Green Procurement and Supply Chain Management

Matthias Stucki

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Agriculture for the Future (3 ECTS)

With its multiple function, including the provision of food, fibres, energy and environmental services, agriculture plays a key role for our future. However, conflicts between the different needs are on the rise, and exacerbated by current trends such as population growth, a growing demand for biofuels, and climate change. The stability of the global food system is jeopardized and a transformation is needed, if we want to feed a growing population without destroying the natural resource base. In this course we will create and evaluate scenarios for the future of agriculture.

Focal points:

Future scenarios of agricultural systems

- Future of soilles agriculture/ community supported agriculture (CSA)/ mountain agriculture/ biofuel production/aquaculture/ urban agriculture/etc.

Drivers of future scenarios

- Politics and economy
- Social movements, consumption and demand
- Technology
- Environmental drivers (e.g. climate change)

Foresight methods

- Analysing signals and trends
- Foresight tools and workshops for scenarios creations

Evaluation of future scenarios

- Sustainability
- Food security
- Trade-offs

Isabel Jaisli

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Aquaculture Systems (3 ECTS)

Aquaculture is not just the farming of fish – it is much more: It concerns a sector that has a significant environmental impact, but also excellent potential for improving sustainability. To operate an aquaculture system successfully, knowledge of biology, ecology, engineering, economics, law and ethics must all be combined. In this module, you will acquire the skills to judge the ecological and economical sustainability of a circulation system for producing food from live animals, which, by its very nature, is subject to close societal scrutiny. You will acquire a skill set that is of importance beyond aquaculture, which will enable you to apply interdisciplinary knowledge in the real world to make informed decisions about resource allocation and (re)use.

Focal points:

Rearing fish

- Fish biology and welfare
- Feeding, husbandry, health

Planning and operating an aquaculture business

- How to identify a good location
- Management, processing, distribution
- Hands-on training

Evaluating an aquaculture concept business plan

- Critical parameters for successful fish farming and how to identify them
- Understanding the legal situation in Switzerland

Dominik Refardt

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Behavioural Change (3 ECTS)

In this module, students gain the necessary knowledge and skills to develop an intervention that fosters sustainable behaviours. Through their own actions and behaviours, individuals can contribute to the achievement of important environmental goals (e.g. 2000-watt society). However, such environmental goals often make it necessary for individuals to change their behaviours (e.g. switching from car to public transport). Due to various psychological barriers, such as habits or inertia, information campaigns and other traditional approaches to changing behaviours often fail. New approaches, such as nudging, are promising solutions, since they also consider the «irrational» factors that influence people's decision-making and behaviours.

Focal points:

Analysing drivers and barriers for behavioural change

- Behavioural change models
- Habits and bounded rationality
- Social influence
- Contextual factors (e.g. infrastructure)

Developing effective behavioural change interventions

- Measuring effectiveness
- Unintended side-effects
- Ethical limitations

Selecting approaches to behavioural change

- Psychological, situational, and structural intervention strategies and techniques
- Nudging
- Community-based interventions

Linda Burkhalter

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CO₂ Management in Companies and Local Authorities (3 ECTS)

Greenhouse gas emissions will have to be dramatically reduced over the next years in order to mitigate global warming. This has important implications for all companies and local authorities, as they will all have to report and actively manage these emissions. This is true for emissions caused by their own activities, as well as for emissions from their supply chain. In this module, students will learn how to report greenhouse gas emissions in accordance with international standards (GHG Protocol Standard). In addition, participants will gain insights into setting up CO₂ management systems for companies or local authorities, how to define emission targets, as well as operate and maintain such systems.

Focal points:

International standards for reporting greenhouse gas emissions

- For companies
- For local authorities

CO₂ management systems

- Developing greenhouse gas inventories
- Operating and managing inventories
- Setting science-based targets

Legal situation (mainly in Switzerland)

- Targets and reduction measures
- International comparison

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Deutsch für Fremdsprachige German as a Foreign Language (2 ECTS)

Der Deutschkurs richtet sich an fremdsprachige Studierende und Mitarbeitende der ZHAW (Niveau A1 bis C1), die ihren Wortschatz und ihre Ausdrucksfähigkeit (schriftlich und mündlich) verbessern sowie ihre Grammatikkenntnisse vertiefen möchten. Je nach Sprachniveau und Gruppengrösse werden inhaltliche Schwerpunkte gesetzt und individuelle Bedürfnisse und Anliegen berücksichtigt.

The German course is aimed at foreign language students and ZHAW staff (levels A1 to C1) who want to improve their vocabulary and expressiveness (written and oral) and strengthen their grammar skills. The content focus is defined based on the language level and the size of the group, taking individual needs and concerns into account.

Ajner Velijoska

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English for Environmental Engineers 2 (2 ETCS)

The principal aim of this module is to improve students' researching, writing, and presenting proficiencies in English, ultimately preparing them for scenarios that they are likely to encounter in their future careers.

Focal points:

- Job applications
- Presentation Skills
- Reading comprehension strategies

Darren Mace

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Environmental Economics (3 ECTS)

Environmental pollution and scarcity of resources continue to increase and intensify into serious conflicts. Environmental economics is at the forefront of the response to local, national and global environmental problems. As such, it has become an essential part of the thinking and actions of national and regional governments, international agencies, as well as the private sector and civil society. The module identifies and discusses the most important contemporary issues in environmental and resource economics, such as climate change and sustainable development. In doing so, the course provides an introduction to selected issues and methods in the field of environmental and resource economics, including theory, evidence and policy.

Focal points:

Key aspects

- The global, regional and local economies from a sustainability perspective
- Pollution as a market failure
- Climate Change Economics
- Valuing the environment through stated and revealed preferences

Target knowledge

- Apply concepts from environmental economics to real life scenarios
- Identify and compare different policy and economic instruments such as taxes and subsidies in environmental management
- Discuss the principles and rationale for environmental valuation
- Use economic arguments to inform and discuss environmental policy proposals

Raushan Bokusheva

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Environmental Ethics (3 ECTS)

This module enables students to develop a differentiated ability to reflect on, discuss and assess a wide variety of projects, mandates and theories that shape and exploit nature, examining the human-nature-relationship from a fundamentally ethical point of view. Following an analytical overview of the prevailing status quo that is characterised by an unsustainable human-nature relationship (see for example agriculture and food supply worldwide), a wide range of alternative solutions will be presented, classified, discussed and ethically evaluated. In the second part of the module, students will be introduced to the process of systematic ethical decision making and will be taught different ethical ways of thinking about and evaluating practices. Case studies in the field of applied ethics in environmental engineering will be used to develop ethical decision making skills. Students will present their own methods for analysing and evaluating different cases, which will be reviewed and discussed by the class.

Focal points:

Key aspects

- Analysis of the ethicalness of the status quo
- Economic, political, anthropological and ethical issues and their interrelations

Existing and future alternatives

- Renewable energies/limitation of growth/sustainable-ecological agriculture/perspectives from the world agricultural report/concrete projects for establishing alternative ways of life

Systematic ethical decision making

- Various evaluation approaches based on different ethical positions (historic-systematic valorization)
- Practical approaches and systematic decision making according to given guidelines

Petra Hodgson

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Master's Thesis

The aim of the Master's Thesis module is to expand students specialist knowledge in a chosen field to the level of an expert. It focuses on independent, scientific work and writing, combining expert knowledge with research methodology through practical application. The content and results of the Master's thesis are documented in a written manuscript and presented orally. Master's graduates are experts who can independently plan, carry out, present and evaluate research projects.

Focal Points:

Conduct research

- Develop a research plan
- Apply subject-specific methodology appropriate to the chosen field
- Independently perform tests

Scientific work

- Test working hypotheses and research questions
- Collect and analyse data
- Apply a critical, problem and solution-oriented approach

Draw conclusions

- Present research results in relation to academic literature
- Document and present results in a manuscript and in an oral presentation

Dirk Steuerwald

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Natural Resource Management in Emerging Economies (3 ETCS)

This module takes an interdisciplinary approach to the management of natural resources in emerging and developing economies. It is divided into three main parts: a) theories and approaches to development and development interventions, b) approaches to understanding the particular challenges of natural resource management in developing and emerging economies, c) practical examples from different regions in the world of how interventions aim to solve environmental as well as social and economic challenges. Throughout the module, students will work on an individual concept or project that is presented at the final conference marking the end of the module.

Focal points:

Development theories

- Historical backgrounds
- Theoretical approaches
- Intervention practices and the pursuit of impact

From theories to practice

- Guest lectures
- Case studies
- Module conference

Development challenges

- Challenges of the global south
- Interrelationships between environment, economy and society
- The tragedy of the commons

Claudia Veith

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Natural Resource Management in Urban Areas (3 ECTS)

Urban habitats play a key role in addressing the grand challenges of the 21st century. Cities can create important impulses through their exemplary role in the fields of energy, mobility, site development, the promotion of urban ecosystems, food systems and the renovation of buildings. However, a variety of factors affect the natural resources management in urban areas. You will get to understand and reflect the basic idea of urban concepts, such as smart sustainable cities, with the most important systems and technologies. In group assignments, the skills acquired during the semester will be applied to analyse specific fields of action and to develop future visions and measures in support of the transformation of communities and towns into a smart sustainable level.

Focal points:

Urbanisation and urban challenges

- Social dynamics, impact assessment
- New metropolitan mainstream, governance

Urban transformation towards smart sustainable cities

- Urban energy and transport planning
- Stakeholder involvement

Urban ecology and gardening

- Ecosystem services
- Sustainable urban food systems

Teaching methods

- Evolving teaching methods, lectures, team-teaching
- Case-studies, seminar, excursion

Vicente Carabias

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Patterns and Trends in Environmental Data (3 ECTS)

How can you conceptualize and then detect patterns and trends in environmental data? In this module students practise transferable data science skills using a typical applied ecology case study: the study of people's and animal's movement behaviours in natural and built environments. This module examines typical data analysis workflow, starting with data capture, followed by pre-processing (cleaning, filtering, aggregating, reshaping data), analytical modeling, and finally visualisation of outcomes, using the R statistics and visualization environment.

Focal points:

Modelling matters

- Introduction into data science
- Conceptual spatial models
- Structuring data

Contextualizing patterns

- Relating data with Joins
- Overlay operations
- Integrating multi-source data

Defining and detecting patterns

- Preprocessing and data issues
- Similarity and segmentation
- Pattern detection algorithms

Presenting patterns

- Visualisation and visual analytics
- Exploratory data analysis

Patrick Laube

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Project Work in Research Group 1 (6 ECTS)

This module examines the process of creating a project proposal for a research or development project. The students can either participate in the formulation of a project proposal or perform research work for future project proposals. The aim is to be able to describe and analyse the expertise in depth. After completion, participants are able to plan and organise a research project independently. The results of the module make a significant contribution to the scientific component of a project proposal.

Focal points:

Project work with practical relevance

- Participation in an ongoing or planned project being conducted by a research group

Independent scientific work

- Project proposal subtasks
- Analysis and written descriptions of personal expertise

Planning a research project

- Creation of a project plan
- Describing framework conditions
e.g. State of research and need

Daniela Harlinghausen

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Project Work in Research Group 2 (6 ECTS)

In this module it is possible to set different priorities. Participants can either perform tasks related to the implementation of a project, for example, the independent execution of data collection or material analysis, depending on the subject area, or they can write a scientific publication. Projects are embedded in the research activities of ZHAW or FiBL. The aim is to be able to present research questions and hypotheses and to write a critical discourse. After completing the course, participants will be able to assess findings presented in specialist discourse and combine them with their own research work. All work requires a high degree of autonomy.

Focal points:

Carrying out research activities

- Data collection
- Material analyses

Evaluation and assessment

- Critical review of research results or project applications

Reference to specialist discourse

- Discussion of project results in a research group
- Integrating results into the current discourse

Daniela Harlinghausen

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Remote Sensing for Ecology (3 ECTS)

Ecological systems are diverse and spatially heterogeneous. Key research topics in this field include the analysis, quantification and scaling of ecological flows, land use and land cover change, relating landscape pattern analysis to ecological processes, conservation, and sustainability. GIS analysis combined with remote sensing using autonomously or remotely operated unmanned aerial or aquatic vehicles (UAVs) equipped with various sensors such as NIR (Near infra-red), TIR (Thermal infrared) or ADP (Acoustic Doppler Profiler) offers new possibilities to obtain scale appropriate measurements of ecological phenomena at high spatio-temporal resolutions.

Basic knowledge of GIS is needed for this course. Written confirmation of the necessary skills or a GIS certificate is required.

Focal points:

Basics of Remote Sensing

- Platforms and sensors
- Principles of remote sensing
- Data acquisition and ground truthing
- Products

Project work

- Integrating Remote Sensing into own research design
- Proposal writing, project implementation and presentation
- Field excursion

Remote sensing data

- Product generation (Orthophoto and surface models)
- Image classification and extracting basic information using GIS
- Evaluation and (critical) interpretation of data

Michael Döring

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Summer School Agrobiodiversity (4 ECTS)

Agrobiodiversity refers to the diversity of crops and livestock species and varieties, the diversity of production and food supply systems, the diversity of agricultural practices and the biodiversity of agricultural land and its ecosystem services. Agrobiodiversity is essential for locally adapted and resilient land use systems across the globe and ultimately contributes to the achievement of several Sustainable Development Goals. In an international group of 30 students you will learn about various agrobiodiversity perspectives and their contribution to the sustainability and resilience of food systems. The module consists of a preparatory phase and a 10-day study course. The Summer School is a cooperation project between the IUNR and the Research Institute of Organic Agriculture (FiBL) and is supported by the Mercator Foundation, Switzerland.

Focal points:

Agrobiodiversity

- Aspects of agrobiodiversity
- Impacts of agrobiodiversity
- Drivers of change in agrobiodiversity

Preparatory phase

- Contribution to the «Agrobiodiversity Wiki»
- Mini case study relevant to the local food system diversity

10-days study week

- Research project within the local agrobiodiversity context
- Field excursions, group work, expert lectures
- Intercultural competence & communication
- International exchange

Roman Grüter

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Summer School Biodiversity Monitoring (4 ECTS)

Biodiversity loss and compositional change of ecological communities are the two main, predominantly negative, consequences of the current rapid change in the global environment that is being driven by humankind. Like biodiversity, biodiversity experts also are in decline, at a time when they are most needed to detect and quantify change, and plan appropriate mitigation actions. To address this issue, an international summer school in the form of a 10-day field class alternatingly in Switzerland (Parc Ela) or Poland (National Park Białowieża) will be attended by teachers and students from abroad.

Focal points:

Nature reserve in Switzerland or Poland

- Local ecosystems
- Nature conservation and socioeconomic setting

Field sampling

- Modern sampling methods
- Sampling designs (including multi-scale sampling)
- Setting up and analysing monitoring schemes
- Advanced statistical analysis of biodiversity data

Advanced species determination

- Vegetation (mainly vascular plants)
- Small mammals
- Invertebrates (mainly grasshoppers)

Project work (2nd week)

- Scientific projects in small groups
- Writing of a scientific report

Jürgen Dengler

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Summer School Climate Change (4 ECTS)

Global challenges require international cooperation on equal terms and innovative solution strategies. You will learn about the impacts and challenges of climate change, focusing on agro-foodsystems in different geographical settings, and will develop possible solutions in international teams. Besides the preparation from a local (Swiss) perspective, you will be connected to and work together with our partners from the Universidade Federal de Grande Dourados (Brasil) and the University of Agricultural Sciences Bangalore (India) using virtual tools and methods (e.g. virtual classroom and teamwork). Due to its virtual setting, this summer school requires limited on-site presence.

Focal points:

Climate Change

- Impacts and challenges
- Solution strategies for mitigation and adaptation
- Case studies from different regions of the world

New tools and methods

- Scope of application of common virtual tools (incl. their advantages, disadvantages and challenges)
- Smartphone video creation

Intercultural and virtual collaboration

- Bridging distances (geographical and cultural)
- Practical experience and reflection

Claudia Veith

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Summer School Closing Cycles (4 ECTS)

This international summer school shows students the path that eco-technologies undergo from basic research to a finished product on the market. The focus will be on circular technologies for decentralized sanitation and wastewater treatment and reuse, and nutrient recovery on household level that involve a recycling loop. The field lab «KREIS-Haus» will serve as a case study for the students to gain an insight into the practical implementation of such technologies. The students will engage themselves in applied workshops and projects and perform data collection and analysis methods in the field. The summer school will take place at Synergy Village, Feldbach, Canton of Zurich, which is the location of the «KREIS-Haus». In the scope of field trips, the students will visit ZHAW Camps Grüental with its extensive research infrastructure as well as showcase projects for circular and sustainable building.

Focal points:

Research on technologies

- Data collection and analysis in the field
- Interpretation and transfer of findings into legal context

Development of technologies

- Understanding development stages of innovation
- Identify and overcome associated challenges

Best practice examples

- Field trips to showcase projects

Devi Bühler

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After Work Courses

These courses are open to all students and employees at the ZHAW. The courses are provided free of charge and encourage social contact, artistic skills and integration in your free time.

Focal Points:

- Sports
- Art and Culture (painting, theatre, singing, gardening)
- Languages (Spanish, French, Italian, German)
- Erasmus Student Network and student associations

All details: www.zhaw.ch/lsvm/feierabend

The information is only published in German, but if something catches your eye, please don't hesitate to ask Caroline Ruckstuhl or your fellow students for help.

Caroline Ruckstuhl

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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 their English language needs. Students have the opportunity to improve written texts and their general writing ability in individual face-to-face sessions or online.

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