LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Module Catalogue

Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management

(Master of Science, M.Sc.)

(120 ECTS credits)

Based on the *Prüfungs- und Studienordnung* adopted by the Senate of Ludwig-Maximilians-Universität München on 25 July 2019

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Abbreviations and annotations

CP	Credit Points, ECTS credits
ECTS	European Credit Transfer and Accumulation System
h	hours
SoSe	summer semester
SWS	contact hours
WiSe	winter semester
WP	compulsory elective course/module
P	mandatory course/module

1. The ECTS credits assigned in the Module Catalogue are designated as follows: Credit Points not listed in parentheses are awarded when the pertinent examination of the module or module parts have/has been completed successfully. Credit Points in parentheses are listed for calculatory purposes only.

2. The semester for taking a module can either be binding or may be considered as a recommendation, depending on the applicable data in Anlage 2 of the Prüfungs- und Studienordnung for your Programme. In this Module catalogue, the options are indicated as “scheduled semester“ and “recommended semester“.

3. Please note: The Module Catalogue is merely intended to serve as an orientation whereas the provisions of the applicable version of the Prüfungs- und Studienordnung (in German only) of your Programme are legally binding. See: www.lmu.de/studienangebot and select your Programme.

Module: P 1 Concepts of Sustainability

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 1.1 Geography and Sustainability (Lecture)	WiSe	30 h (2 SWS)	60 h	(3)
Exercise	P 1.2 Geography and Sustainability (Exercise)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	P 1.1: Fakultät 13: Zertifikatsstudium „Environmental Studies Certificate Program"
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	This course explores current issues in sustainability and the role of geography, both human and physical geography, in sustainability studies. The course addresses what 'sustainable development' means and how and why it is a contested field. Various approaches to sustainability in economic geography, tourism geography, urban geography, environmental policy, climatology, hydrology, and resource and environmental management are introduced and discussed through a series of lectures and seminars. The course is intended as an introduction to the programme and to the staff of the Geography Department. The exercise aims at applying the theories on concrete issues, e.g. by visiting firms and organisations.
Learning outcomes	Professional and methodological Competencies: After completing the module, students are able • to understand the role of Geography in Sustainability studies • to understand the role of sustainable development in geographic research

	• to understand and analyse human constructions of the environment as sustainability problems • to understand key approaches to environmental management • to understand the issues arising in a number of fields within human geography concerning sustainable development • to apply basic concepts which link local and global issues Social and personal Competencies: After completing the module, students are able • to research and elaborate geographic and sustainability literature • to critically question ideas, approaches and models • to know the state of the art in geographic research into sustainable development
Type of examination	Written exam
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. M. Garschagen / Prof. Dr. J. Schmude
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 2 Special Aspects of Geography and Sustainability Concepts and Definitions

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 2.1 Conceptual Approaches of Sustainable Development	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Mandatory module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	This module explores general questions of sustainability in an interdisciplinary context. The students get to know sustainability as a multidimensional concept and a multifarious challenge for the global community. They discuss the main political texts and issues of ethics and sustainability. The examples chosen are embedded in different regional contexts. The seminar also introduces policies and programs related to problems in sustainability at different regional scales.
Learning outcomes	<u>Professional and methodological Competencies;</u> After completing the module, students • understand the concept of sustainability in its three dimensions and their interrelation • can apply the concept of sustainability in different regional contexts • have knowledge about ethics and sustainability • know concepts of social change and their relation to

	sustainability • know possibilities, incentives and difficulties to integrate practices of sustainability in organizations and everyday life <u>Social and personal Competencies:</u> After completing the module, students are able • to know the state of the art in general research about sustainability • to participate in the interdisciplinary discussion about sustainability • to develop and critically question policies and programs relating to sustainability
Type of examination	Presentation and term paper
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. G. Winder / Prof. Dr. J. Schmude / Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 3 Special Aspects of Geography and Sustainability Transition and Resilience

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 3.1 Transition Paths towards Sustainability	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Mandatory module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	This module explores general questions of sustainability in an interdisciplinary context. This module considers pathways towards a more sustainable society in different regional contexts. The students get to know the concept of transition, resilience, path dependency in relation to sustainability and apply them into a specific case study.
Learning outcomes	Professional and methodological Competencies; After completing the module, students • understand the concept of transition and resilience in its relation to sustainability • can apply the concept of transition and resilience in different regional contexts • know concepts of social change and their relation to sustainability • know possibilities, incentives and difficulties to in transitions towards sustainability in their different practical applications.

	Social and personal Competencies: After completing the module, students are able • to know the state of the art transition, resilience and sustainability research • to participate in the interdisciplinary discussion about transitions towards sustainability • to develop and critically question policies and programs relating to transitions towards sustainability
Type of examination	Presentation and term paper
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. G. Winder / Prof. Dr. J. Schmude / Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 4 Quantitative Methods

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 4.1 Quantitative Methods and Statistics (Lecture)	WiSe	30 h (2 SWS)	60 h	(3)
Exercise	P 4.2 Quantitative Methods and Statistics (Exercise)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	This module covers quantitative methods of data analysis employed within the areas of Human-Environment Relations and Human Geography. It provides an opportunity to identify common sources and types of quantitative data and critically reflect on the statistical methods applied to these. The module revises basic topics in statistics, including types of data variables, probability theory, sampling theory, and descriptive, inferential and goodness-of-fit statistical analyses. Additional topics include multivariate methods (factor analysis, ANOVA and multivariate regression), logistic regression, Bayesian statistics, and methodological concerns. Participants are also made aware of more advanced topics and how to obtain more information about them when used in later work. Included here are cluster analysis, non-parametric methods, Monte Carlo simulation, Q-Methodology, multi-level modelling, structural equation modelling, and network analysis. Examples and exercises are given during the module employ software supported by LMU (e.g. Excel and SPSS).

Learning outcomes	Professional and methodological Competencies: After completing the module students are able • to understand the major sources of quantitative data in the areas of Human-Environment Relations and Human Geography • to apply suitable statistical analysis methods to these data • to critically reflect on analyses found in social science literature Social and personal Competencies: After completing the module students are able • to perform several common types of statistical analyses with the aid of computer software • to discuss more advanced statistical techniques and how to learn more about their use
Type of examination	Written exam
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 5 Qualitative Methods

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 5.1 Empirical Social Science Methods (Lecture)	WiSe	30 h (2 SWS)	60 h	(3)
Exercise	P 5.2 Empirical Social Science Methods (Exercise)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	To enable students to assess progress toward sustainable development, the module introduces a range of qualitative methods. Besides discourse analysis of environmental texts such as policy documents and journalistic coverage, landscape representations in photographs, paintings, travel writing, and film, as well as cartographic and statistical representations are addressed. Interview practices, ethnographic fieldwork, and issues of positionality raised in feminist and postcolonial studies as well as mental mapping are a further component. The module then considers a range of assessment methods in terms of their effectiveness, including new environmental indicators, monitoring practices, assessment procedures, as well as 'gap to target' frameworks and state of the environment reporting, and qualitative network analysis.
Learning outcomes	Professional and methodological Competencies; After completing the module, students are able • to understand the postcolonial and feminist

	critiques of positivist knowledge construction • to analyze various representations of environments • to conduct qualitative interviews and participant observation, as well as life-world analysis. • to conduct gap to target framework analysis • to conduct qualitative network analysis • to understand state of the environment reports and environmental monitoring practices • to develop and apply monitoring and assessment schemes Social and personal Competencies: After completing the module, students are able • to understand and communicate their own positionality in relation to their research and to those whom they are researching • to understand and communicate sustainability assessments • to advise on best practice in sustainability assessment
Type of examination	Written exam
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. G. Winder
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 6 Field Trip in Sustainability

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 6.1 Preparation Excursion	WiSe	30 h (2 SWS)	60 h	(3)
Excursion	P 6.2 Excursion	SoSe	-	90 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	Taking the knowledge acquired in the Master's course as a point of departure, students will analyze special issues of sustainability in a region within or outside Europe and with unique regard to current reserach. In the seminar, students make themselves familiar with the region to be visited in an interdisciplinary manner including historical, environmental, cultural, social and political aspects. Local characteristics and important stakeholders will be identified; a field trip schedule will be developed. Students investigate issues of sustainability in an example region in a targeted manner, and evaluate the processes against the background of sustainable development from the macro-level through the meso-level to the micro-level. Visiting academics, NGOs, businesses, planners, politicians etc., as well as own empirical surveys, represent a fixed component of the field trip and deepen and supplement the knowledge acquired in the seminar. Strategies for achieving sustainable development are demonstrated on the ground and evaluated concerning their functionality and efficiency.
Learning outcomes	Professional and methodological competencies: After the direct reference to current research in the field trip the students are able

- to apply concepts and models to findings in the region
- to name and understand regional diversity in sustainability by comparing the region visited with other regions
- to assess government and governance measures from a sustainability perspective

Social and personal competencies:

After the field trip the students are able

- to investigate issues of sustainability in a region
- to discuss issues of sustainability with practitioners and scientists alike
- to critically reflect on the findings in the field drawing on the knowledge acquired during the master program in general and the seminar in particular

Type of examination	Presentation and poster
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. J. Schmude
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben. – Die Exkursion ist kostenpflichtig. Die anfallenden Kosten werden bei Ankündigung der Veranstaltung bekannt gegeben.

Module: P 7 Scientific Tools I

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 7.1 Scientific Methods	WiSe	30 h (2 SWS)	60 h	(3)
Seminar	P 7.2 Sustainability Assessment	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module is intended to provide for specific skills and tools the students need for scientific work in particular, and for their professional training as well. Scientific Tools is based on two pillars: Reading and Thinking. Techniques of speed reading / visual reading are introduced enabling the students to read texts faster while at the same time being able to recall the contents afterwards (mnemo-techniques and mind-mapping). Furthermore, the three fundamental streams of scientific thinking – nomothetic, ideographic and constructivitst perspectives of science – are introduced. Against this background, principles of interdisciplinary research are demonstrated which can be applied integratively in the modules linking human and physical geography as well as the project seminar, the internship and the master's thesis. Based on this theoretical knowledge, applicable tools of "thinking" like mind-mapping, methods of creativity, logics and ways of structuring scientific thoughts are introduced.
Learning outcomes	<u>Professional and methodological competencies;</u> After completing the module, students are able • to apply techniques of reading faster and memorizing the content of texts

	• to combine different streams of scientific thinking • to creatively identify and approach research questions • to identify appropriate methodology and data for a research project • to identify the chances and challenges of interdisciplinary research Social and personal competencies: After completing the module, students are able • to apply fundamental scientific tools • to critically reflect on different scientific perspectives and methods • to work in an interdisciplinary manner
Type of examination	Presentation or exercise portfolio
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	PD Dr. M. Popp / Prof. Dr. H. Rau / Prof. Dr. J. Schmude
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 8 Special Aspects of Geography and Sustainability Trade-offs

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 8.1 Trade-offs in Sustainability	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Mandatory module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	This module explores general questions of sustainability in an interdisciplinary context by considering how trade-offs are made in assessments and in policies for sustainability. The students get to know sustainability as a multidimensional concept and a multifarious challenge for the global community. They discuss the main political texts and issues of ethics and sustainability. This module considers pathways towards a more sustainable society in different regional contexts. It imparts knowledge about the problem of trade-offs within and between the three dimensions of sustainability at different spatial scales.
Learning outcomes	Professional and methodological Competencies: After completing the module, students • understand the concept of sustainability in its three dimensions and their interrelation • can apply the concept of sustainability in different regional contexts • have knowledge about ethics and sustainability • know concepts of social change and their relation to sustainability

	• know possibilities, incentives and difficulties to integrate practices of sustainability in organizations and everyday life • understand the problem of trade-offs in sustainable development and can apply it in case studies <u>Social and personal Competencies:</u> After completing the module, students are able • to know the state of the art in general research about sustainability • to participate in the interdisciplinary discussion about sustainability • to develop and critically question policies and programs relating to sustainability
Type of examination	Presentation and term paper
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. G. Winder / Prof. Dr. J. Schmude / Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 9 Scientific Tools II

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Project Seminar	P 9.1 Project Seminar in Sustainability	SoSe	60 h (4 SWS)	120 h	(6)
Seminar	P 9.2 Proposal Writing	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	In this module students are planning and carrying out a research project. Thereby, they have to deal with the following project phases: • Conceptualizing the research project (Identifying the research gap, developing research questions, selecting the methods and setting the time schedule) • Carrying out a research project (Collecting data in the field, analysing and interpreting the data) • Presenting and report writing (Training of clear reasoning, rhetorical skills and knowledge of visualization tools). Furthermore, the students get an overview of research funding opportunities, academic journals and strategies in conference and CfP (call for papers) tracking. They will practice relevant skills (e.g. writing a proposal for a research project, a conference application, an academic paper, a paper review aswell as organigzing a conference). In terms of didactics, teaching this module means to

	activate and develop the student's skills by impulse and training rather than "teaching" knowledge.
Learning outcomes	Professional and methodological competencies; After completing the module, students are able • to creatively identify and approach research questions • to logically structure scientific thoughts • to demonstrate their ability to work in a team and to deadlines • to identify a research question, appropriate methodology and data, and to communicate these effectively • to carry out a research project • to communicate the significance of a research project or question within science to communicate complex ideas and research findings effectively • to track the changing research funding opportunities and environment • to relate a research proposal to the scientific literature • write e.g. a proposal for a research project, a conference application, an academic paper, a paper review as well as organizing a conference Social and personal competencies: After completing the module, students are able • to apply fundamental scientific tools • to present and discuss findings orally and in a written form • to critically reflect on different scientific perspectives and methods • to work in an interdisciplinary manner • to work in a team • to write and present a research proposal
Type of examination	Presentation and term paper
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	PD Dr. M. Popp / Prof. Dr. H. Rau / Prof. Dr. J. Schmude
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 10 Sustainability and Resources

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 10.1 Sustainable Management of Resources (Lecture)	SoSe	30 h (2 SWS)	60 h	(3)
Exercise	P 10.2 Sustainable Management of Resources (Exercise)	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	P 10.1: Fakultät 13: Zertifikatsstudium „Environmental Studies Certificate Program"
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	This module is intended to look into key themes related to Geography and Sustainability. In particular, issues related to resources, such as resource scarcity of water, energy, phosphorous will be studied in relation to land use. A multi- and interdisciplinary perspective is taken to look in these themes. In particular, the following themes will be presented and elaborated upon: • Sustainable water management • Sustainable energy management • Sustainable land use • Sustainable nutrient management A special focus will be set on the analysis of socio-economic aspects of sustainability in the themes studied.
Learning outcomes	<u>Professional and methodological Competencies;</u> After completing the module, students are able • to understand themes of Geography and Sustainability from a multidisciplinary perspective

- to analyse the human influence in different problem contexts
- to understand the interaction between the resources water, energy and land use and their management
- to understand the potential and drawbacks of different management options regarding the three sustainability dimensions
- to apply basic concepts which link local and global issues
- to understand the role of spatially explicit analyses

Social and personal Competencies:
After completing the module, students are able

- to research and elaborate scientific literature
- to present findings both in oral and written form
- to work in an interdisciplinary manner
- to critically question ideas and models, to assess those and to develop new ones

Type of examination	Written exam
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. M. Garschagen / Prof. Dr. G. Winder
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 11 Trends Assessment, Scenario and Modeling

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 11.1 Trends Assessment, Scenario and Modeling (Lecture)	SoSe	30 h (2 SWS)	60 h	(3)
Exercise	P 11.2 Trends Assessment, Scenario and Modeling (Exercise)	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Computer simulation models are being increasingly used for understanding social-ecological systems. They can give us knowledge about real-world systems that, for practical, ethical or economic reasons, we cannot always obtain from direct intervention and observation of the system itself. This course focuses on individual-based or agent-based simulation, which represents diverse individuals and their interactions in an environment, and reveals through visualization and statistics the emergence of patterns of organization among these individuals. Example applications come from the areas of Human-Environment Relations and human geography among others. We will explain how agent-based simulation differs from system dynamics, statistical modeling and mathematical analysis. Key concepts and issues in the field of social simulation are discussed, including emergence and complexity, bottom-up explanation, pattern-oriented modeling and generative mechanisms, visual interaction, how to write up a modeling project, and the differences from familiar

	quantitative and qualitative research methods. Students are also made aware of more advanced simulation topics, including experiment design, validation and verification, output analysis, spatial and social networks, and agent cognition. Students learn the basic features of an easy agent-based simulation software package, *NetLogo*, and about sources of help with programming and how to use them legitimately.
Learning outcomes	Professional and methodological Competencies: After completing the module students are able • to develop easy to communicate causal loop diagrams • to relate social simulation to quantitative and qualitative research methods • to understand the differences in technique and applications between major types of computer simulation and other types of modelling Social and personal Competencies: After completing the module students are able • to design a simulation modeling project, including model purpose, conceptual modeling, data requirements, theoretical assumptions, verification and validation, stakeholder participation, experimentation and writing up • to implement a small agent-based model relevant to the areas of Human-Environment Relations and Human Geography, using NetLogo
Type of examination	Exercise portfolio
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 12 Land Use Systems and Land Use Conflicts [Landnutzungssysteme und Landnutzungskonflikte]

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 12.1 Land Use (Lecture) [Landnutzung]	WiSe	30 h (2 SWS)	60 h	(3)
Seminar	P 12.2 Land Use (Seminar) [Vertiefungsseminar zur Vorlesung Landnutzung]	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses.
Usability of the module in other Programmes	Fakultät 20: Master-Studiengang „Umweltsysteme und Nachhaltigkeit – Monitoring, Modellierung und Management" P 12.1: Fakultät 13: Zertifikatsstudium „Environmental Studies Certificate Program"
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module explores questions of land use systems at different spatial levels and in different regional contexts. The role of agriculture, industry, energy production, human settlement and tourism and leisure activities are presented as the main elements of contemporary land use systems. Besides the analysis of the market driven forces in land use systems, protected areas and their implementation and management are a further subject of this module. The module also deals with concepts and methods that can be used to analyze and to manage land use conflicts and to foster the development of more sustainable land use systems at different spatial levels.
Learning outcomes	Professional and methodological Competencies;

	After completing the module, students • are able to understand the role of land use systems for a sustainable development on a local, regional and global scale • have knowledge of different forms of land use systems and their driving forces • know the most important social, economical and political factors influencing land use systems in different regions of the world • have knowledge of strategies and methods for transitions towards more sustainable land use systems • know methods to analyze and to deal with land use conflicts Social and personal Competencies: After completing the module, students • know the state of the art in land use science • can easily get along with new literature in land use sciences • can critically question policies in their impact on land use systems
Type of examination	Presentation or poster
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. W. Mauser / Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 13 Transdisciplinarity

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 13.1 Transdisciplinary Methods	WiSe	30 h (2 SWS)	60 h	(3)
Project Seminar	P 13.2 Transdisciplinary Project	WiSe	60 h (4 SWS)	300 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	In this module, students learn the principals of transdisciplinary research and conduct a transdisciplinary project planned together with a firm, government agency or NGO, or an exchange with another university programme. At the end of their transdisciplinary project students will report in a presentation and a written report the outcomes of their study and reflect on its utility and problems of transdisciplinary research.
Learning outcomes	<u>Professional and methodological Competencies;</u> After completing the module, students are able • to demonstrate the application of their skills and competencies in a transdisciplinary setting • to demonstrate learning in practice from professionals who are from outside their own field • to learn when transdisciplinary research is adequate • to contribute to further development of sustainable development goals

	Social and personal Competencies: After completing the module, students are able • to demonstrate their aptitude for professional work in a transdisciplinary setting • to reflect on their capacities, performance and interactions for transdisciplinary research
Type of examination	Presentation and project report
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Henrike Rau / PD Dr. Monika Popp
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: WP 1 Applied Quantitative Methods

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 1.1 Applied Quantitative Methods (Seminar)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	The module can be chosen in compliance with the following rules: With regard to the compulsory elective modules WP 1 – WP 4, three modules must be chosen.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	In this module, the students specialize themselves in the statistics they were taught in the semester before. Not only application of descriptive and analytical statistical methods to answer particular research questions, but also the use of Geographical Information Systems (GIS) will be taught in the modul. They should be able to master these methods in order to apply them in their internship and/or in their master thesis.
Learning outcomes	Professional and methodological competencies: After completing the module, students are able • to apply a method relevant for sustainability analysis to a specific problem • be able to design a study in which the method can be applied in a meaningful way • to assess a series of options from a sustainability perspective Social and personal Competencies: After completing the module, students are able

- to research and elaborate scientific literature
- to present findings both in oral and written form
- to critically question ideas and models, to assess those and to develop new ones
- to analyse databases and interpret the statistical findings

Type of examination	Exercise
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. J. Schmude
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: WP 2 Applied Qualitative Methods

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 2.1 Applied Qualitative Methods (Seminar)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	The module can be chosen in compliance with the following rules: With regard to the compulsory elective modules WP 1 – WP 4, three modules must be chosen.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	In this module the students specialize themselves in qualitative methods they were taught in the semester before in Module 5 Qualitative Methods and apply these to a specific issue. They should be able to master these methods in order to apply them in their internship and/or in their master thesis.
Learning outcomes	<u>Professional and methodological Competencies:</u> After completing the module, students are able • to apply methods relevant for sustainability analysis to a specific problem • be able to design a study in which the methods can be applied in a meaningful way • to assess a series of options from a sustainability perspective • to be able to interact with natural scientists and be able to contribute to an integrative model <u>Social and personal Competencies:</u> After completing the module, students are able

- to research and elaborate scientific literature
- to present findings both in oral and written form
- to work in an interdisciplinary manner
- to critically question ideas and models, to assess those and to develop new ones

Type of examination	Term paper or exercise
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. G. Winder
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: WP 3 Applied Trends Assessment, Scenario and Modeling

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 3.1 Applied Trends Assessment, Scenario and Modeling (Seminar)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	The module can be chosen in compliance with the following rules: With regard to the compulsory elective modules WP 1 – WP 4, three modules must be chosen.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	In this module the students specialize themselves in simulation modeling they were taught in the lecture and exercise simulation modeling (P11) and apply this to a specific issue. They should be able to master the method in order to apply it in their internship and/or in their master thesis. Potential method courses comprise e.g. Agent based modeling.
Learning outcomes	Professional and methodological Competencies: After completing the module, students are able • to apply the method relevant for sustainability analysis to a specific problem • be able to design a study in which the method can be applied in a meaningful way • to assess a series of options from a sustainability perspective • to be able to interact with natural scientists and be able to contribute to an integrative model

	Social and personal Competencies: After completing the module, students are able • to research and elaborate scientific literature • to present findings both in oral and written form • to work in an interdisciplinary manner • to critically question ideas and models, to assess those and to develop new ones
Type of examination	Term paper or exercise
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. M. Garschagen
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: WP 4 Applied Sustainability Assessment

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 4.1 Applied Sustainability Assessment (Seminar)	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory course
Usability of the module in other Programmes	--
Elective guidelines	The module can be chosen in compliance with the following rules: With regard to the compulsory elective modules WP 1 – WP 4, three modules must be chosen.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	In this module the students specialize themselves in sustainability assessment they were taught in P7/II and apply this to a specific issue. They should be able to master the method in order to apply them in their internship and/or in their master thesis.
Learning outcomes	<u>Professional and methodological Competencies;</u> After completing the module, students are able • to apply the methods relevant for sustainability analysis to a specific problem • be able to design a study in which the methods can be applied in a meaningful way • to assess a series of options from a sustainability perspective • to be able to interact with natural scientists and be able to contribute to an integrative model <u>Social and personal Competencies:</u> After completing the module, students are able

	• to research and elaborate scientific literature • to present findings both in oral and written form • to work in an interdisciplinary manner • to critically question ideas and models, to assess those and to develop new ones
Type of examination	Term paper or exercise
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Henrike Rau
Language(s)	English / German
Additional information	Literaturhinweise für das Modul werden zu Beginn des Semesters in der jeweiligen Veranstaltung bekannt gegeben.

Module: P 14 Final Module

Programme	Master's Programme: Human Geography and Sustainability – Monitoring, Modeling and Management (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Master's Thesis	P 14.1 Master's Thesis	WiSe and SoSe	-	810 h	(27)
Disputation	P 14.2 Disputation	WiSe and SoSe	-	90 h	(3)

For successful completion of the module, 30 ECTS credits have to be acquired. Class attendance averages about 0 contact hours. Including time for self-study, 900 hours have to be invested.

Module type	Mandatory module
Usability of the module in other Programmes	--
Elective guidelines	None
Entry requirements	Successful completion of the modules P 1 – P 11
Semester	Recommended semester: 4
Duration	The completion of the module takes 1 semester.
Content	Our Masters degree requires the successful completion of a research thesis. Thesis topics may be drawn from a wide range of areas in geography, but students should make their choice in consultation with a supervisor. The thesis should elaborate theory and include empirical fieldwork, and contribute to the field of human geography and sustainability. The student will present and defend his or her thesis in a colloquium.
Learning outcomes	<u>Professional and methodological Competencies;</u> After completing the module, students are able • to manage and execute a major research project • to write a large publishable work to a professional standard using methods and theories learned during the programme of study <u>Social and personal Competencies:</u> After completing the module, students are able

	• to conduct a substantive research project in human geography • to contribute to the scientific literature • to present, discuss and defend their research findings
Type of examination	Master's thesis and disputation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. J. Schmude / Prof. Dr. M. Garschagen / Prof. Dr. G. Winder
Language(s)	English / German
Additional information	Einmalige Wiederholbarkeit