

## MASTER OF SCIENCE IN NATURAL RESOURCES MANAGEMENT

The Master of Science in Natural Resources Management programme is a two-year international interdisciplinary programme, consisting of the three specializations Biology, Resource Geology and Geography. It is especially designed to give the students an understanding of the importance of management for sustainable use of natural resources, an understanding of the connections and the ability to communicate between different disciplines and actors.

Natural resources provide mankind with important ecosystem services such as clean water, energy, minerals and biological resources in terrestrial, aquatic and marine ecosystems which are essential for survival and development of mankind. However, the increasing demands for these natural resources due to the growth of the human population combined with the decrease of the finite resources urgently calls for a sustainable management of these resources. Such management requires an interdisciplinary approach including in-depth knowledge about specific resources as well as a holistic perspective, including ecological, economic and social aspects. It also requires a strong ability to communicate in order to establish dialogues between the different disciplines involved as well as between the stakeholders, and a good understanding of the connections between these different actors.

MSc programme in Natural Resources Management aims at giving a unique education and required knowledge that will contribute to find sustainable solutions of interdisciplinary challenges related to the management of natural resources.

The Master of Science in Natural Resources Management is an interdisciplinary cooperative programme involving three faculties at NTNU, and the programme is administrated by the Faculty of Natural Sciences and Technology.

The programme offers 3 specializations:

- Biology
- Resource Geology
- Geography

### Learning outcomes

The interdisciplinary master programme in Natural Resources Management provides students with advanced knowledge, analytical skills and general competence at an advanced level aiming for work within the fields of research, public administration, governmental and non-governmental organizations, education and industry.

The Masters in Natural Resources Management offers specializations in the 3 disciplines: Biology, Resource Geology and Geography. The master's programme includes 30 ECTS elective courses that allow students to be interdisciplinary and flexible in the individual composition of their academic profile.

The program will provide a thorough insight into processes and mechanisms related to conflicting interests over the use of natural resources. In the master's thesis the student will obtain an advanced in-depth understanding in a topic that is relevant within the field of management of natural resources.

### Knowledge

The MSc graduate in Natural Resources Management has:

- Substantial multidisciplinary knowledge about natural resources management related to the research within the specialization
- Substantial knowledge in a specific area based upon research experience from a masters project
- Substantial knowledge about various methodological and analytic approaches that are used within the specialization.

### **Proficiency/Skills**

The MSc graduate in Natural Resources Management:

- Can independently carry out a complete scientific work process, including the theoretical background, hypotheses generation, collecting and analyzing data as along with the interpretation of results and their presentation
- Has high competence and multidisciplinary project experience within selected topics related to natural resources management and ability to contribute in a multidisciplinary team towards the management and sustainable use of natural resources
- Can critically evaluate methods and results within the field of specialization.

### **General Competence**

The MSc graduate in Natural Resources Management:

- Can communicate research results in English, both in written and oral to both professionals and to a wider audience
- Can acquire and evaluate research information
- Can work on a project independently and in cooperation with others in interdisciplinary groups
- Can contribute to innovative thinking within the specialization in particular
- Has competence within Health- Environment and Safety in general, and within Health- Environment and Safety within the specialization in particular
- Is familiar with research ethics.

### Specialization: Biology

With a specialization within biology the student holds an in-depth competence within the fields of conservation biology, ecology, evolution, systematics and/or physiology. The student with specialization within biology will through the work on the master project obtain an in-depth knowledge *in a biologically based research topic* which is related to the management of the biological resource in question.

The MSc graduate in Natural Resources Management with biology specialization will hold the following knowledge and skills:

### **Knowledge**

The MSc graduate in Natural Resources Management has:

- A broad knowledge within the respective biological field (theoretical and experimental) and how this integrates with management of natural resources for sustainable use
- Knowledge about biological diversity, ecosystem services and other aspects of conservation biology and how this knowledge can be applied to find environmentally sound solutions
- A thorough understanding of evolutionary and ecological processes.

### **Proficiency/Skills**

The MSc graduate in Natural Resources Management:

- Can apply the biological knowledge as well as the knowledge about management of

natural resources within research, public administration, governmental and nongovernmental organizations

- Can evaluate and apply relevant theory, methods and analytic approaches within the respective field of biology, including statistical methods
- Can implement knowledge from several research fields and disciplines.

#### Specialisation: Geography

A specialization within geography provides the student with in-depth competence within selected geographical concepts and theories, and skills for applying this competence to natural resource management issues. The students also attain an in-depth competence in relevant geographical research methods and understand their relevance for research on natural resource management issue. The student specializing in geography will through the master project acquire in-depth knowledge within a research topic directly or indirectly related to the natural resource management issue in question.

The MSc graduate in Natural Resources Management specializing in geography will hold the following knowledge and skills:

#### **Knowledge**

The MSc graduate in Natural Resources Management has:

- Acquired a deep understanding of general concepts and theories from the field of geography, and integrated this with an understanding of concepts and theories from the specific field of natural resource management
- Knowledge about research fields in geography such as environmental geography, political ecology, natural resource management or other relevant specialisations in geography, and understand how this knowledge can be applied on environmental issues.

#### **Proficiency/Skills**

The MSc graduate in Natural Resources Management:

- Can evaluate and apply relevant theory, methods and analytic approaches within the field of geography on natural resource management issues
- Can implement knowledge from several research fields and disciplines
- Can apply geographical knowledge as well as knowledge about management of natural resources in public administration, governmental and non-governmental organisations.

#### Specialisation: Resource Geology

#### **Knowledge**

The MSc graduate in Natural Resources Management has:

- A solid theoretical knowledge of mineral and ore-deposit forming processes
- Specialized knowledge on a specific type of geological deposits.
- Specialized knowledge of several analytical methods relevant to in depth studies of geological deposits
- General knowledge of mining techniques and environmental as well as socio-cultural implications of economic exploitation of geological deposits

#### **Proficiency/skills**

The MSc graduate in Natural Resources Management

- Are able to partake in studies of geological deposits in collaboration with relevant experts
- Know where to find and how to retrieve and interpret relevant geological background

- information
- Know how to design and initiate sampling of geological data relevant for a given deposit type

## Admission Requirements

### General requirements

Norwegian/Nordic and international applicants should hold a BSc degree or equivalent university education either in Biology, Resource Geology or Geography. Applicants holding another related Bachelor degree may also be considered. There will be an individual evaluation of applicants. The Bachelor degree must be in accordance with the admission requirements to one of the three specializations in this Master's programme. To illustrate; a background with a Bachelor degree in Biology does not qualify for admission to MSc Natural Resources Management with specialization in Resource Geology, but may only qualify for the specialization in Biology. Thus, the Bachelor background of the applicant must be consistent with the specialization in the MSc Natural Resources Management programme that you apply for.

### Specialization Biology:

Applicants who apply for specialization in Biology need to have a Bachelor degree including basic courses in biology, minimum 80 ECTS. As example of requirements, check the plan of study in BSc degree in Biology at NTNU (<http://www.ntnu.edu/studies/bbi>). The bachelor degree must include courses in resources management, planning and/or interdisciplinary project management equivalent of minimum one quarter of a year full time study. Priority will be given to applicants with background in introductory university level in Mathematics and Statistics.

### Specialization Resource Geology:

Applicants who apply for a specialization in Resource Geology must hold a Bachelor degree in Bedrock-and Resource Geology or equivalent. As an example of requirements, check the plan of study for BSc degree in Bedrock- and Resource Geology at NTNU (<http://www.ntnu.edu/studies/bgeol/bedrock>). Introductory university level of Mathematics and Statistics are required. The bachelor degree must include courses in resources management, planning and/or interdisciplinary project management equivalent of minimum one quarter of a year full time study.

### Specialization Geography:

Applicants who would like to apply for specialization in Geography should hold a Bachelor degree including at least 80 ECTS of studies within geography and/or natural resources management. Other relevant qualification can be accepted upon approval by the Department of Geography.

The bachelor degree must include courses in resources management, planning and/or interdisciplinary project management equivalent of minimum one quarter of a year full time study. Applicants with a Bachelor of Social Sciences in Geography from NTNU are qualified

for admission.

### English language requirements

Applicants who are not exempted from the English language requirement, must document that they have passed a recognized test in English; TOEFL or IELTS.

<http://www.ntnu.edu/studies/langcourses> TOEFL (Test of English as a Foreign Language) with a minimum score of 600/90 points on the paper based/internet based test IELTS (International English Language Testing Service) with a minimum score of band 6.5.

### Programme Structure and specializations

**About the study programme:** The MSc programme in Natural Resources Management is a 2 years of full-time study (120 ECTS credits) integrating Norwegian/Nordic and international students. The normal workload for a full-time student during one academic year is 60 ECTS credits. The study is structured around 4 compulsory core courses, elective courses and a Master's thesis (60 ECTS credits).

The Master's thesis is to be planned and started already in the first semester and has to be completed in semester 4. The thesis work will as far as possible be integrated in ongoing research projects at their respective department according to the field of study. The content of the thesis should fulfill an academic level appropriate to master level course. An individual supervisor will be assigned in semester 1, who will be responsible for supervising the Master's thesis.

One of the compulsory core course is RFEL3080 Scientific Seminars, which is running through all the 4 semesters. There are also a number of elective courses, which give options to fit background and interests for the student throughout the studies.

**Field work:** After the first year of studies, during the period of mid-June to mid-August, the candidates may be given the opportunity to go back to their home countries to do field work if this is necessary for the completion of their thesis. Students who are supported by the Quota Programme are awarded an extra grant to cover field-trip expenses. Students outside the Quota Programme must cover the travel and field costs themselves. Project allowances are offered in some special cases.

### Structure of the International Masterstudy in Natural Resources Management

Year	Semester					Total credits
2	4. semester Spring	Special Syllabus for Master Degree* (7,5 credits)				30
	3. semester Autumn	Master Thesis (60 credits)				30
1	2. semester Spring	Elective course (7.5 credits)	Elective course (7.5 credits)	Elective course (7.5 credits)		30
	1. semester Autumn	Elective course (7.5 credits)	RFEL 3081 Natural Resources Management, Interdisciplinary Project (7.5 credits)	GEOG 3030 Natural Resources Management (7.5 credits)		30
						120
		Mandatory courses (30 credits)				
		Elective courses (30 credits)				
		Master thesis (60 credits)				

\* Course code for Special Syllabus for Master's Degree for each of the specializations in the programme:

Biology: BI3091

Resource Geology: GEOL3093

Geography: GEOG3091

The Special syllabus examination (and similar special curriculum courses) can be held either together with the final Master's examination or at an earlier stage in the master programme. This encompass all the specializations at the programme, (BI3091, GEOL3093, GEOG3091)

\*\* Course code for Master's Thesis for each of the specializations in the programme:

Biology: NATRBI3900

Resource Geology: GEOL3090

Geography: GEOG3940

#### Elective Course list 2014-2015

BI2001 Biogeography and Biosystematics (7,5 credits) Spring

BI2041 Human Evolution and Behaviour (7,5 credits) Autumn

BI2017 Genetics and Evolution I (7,5 credits) Autumn

BI2033 Population Ecology (7,5credits) Spring\*

BI2034 Community Ecology (7,5credits) Autumn \*

BI2043 Biodiversity and Conservation Biology I (7,5 credits)Autumn\*

BI2044 Ethology (7,5 credits) Spring

BI2045 Communication and Reproduction Behaviour (7,5 credits) Spring

BI3010 Population Genetics (7,5 credits) Autumn

BI3036 Plant Ecology (7,5 credits) Autumn

BI3037 Freshwater Ecology (7,5 credits), Autumn  
 BI3051 Evolutionary Analyses (7,5 credits) Autumn  
 BI3072 Environmental Toxicology (7,5 credits) Autumn  
 BI3082 Biodiversity and Conservation Biology II (7,5 credits) Autumn  
 BI3083 Evolutionary and Ecological Genetics (7,5 credits) Spring  
 BI3084 Conservation Biology (7,5 credits) Autumn  
 BI3040 Behavioural Ecology (7,5 credits) Spring  
**\*BI2017, BI2033, BI2034 and BI2043 are mandatory in BSc Biology, NTNU and these students cannot choose these elective courses.**  
 TGB4115 Mineral Deposit Geology (7,5 credits) Autumn  
 TGB4120 Prospecting and Formation of Selected Ore-Deposits (7,5 credits) Spring  
 TGB4135 Basin Analysis (7,5 credits) Spring  
 TGB4170 Diagenesis/Reservoir Quality (7,5 credits) Spring  
 TPG4177 Carbonate Reservoir Characterization (7,5 credits) Autumn  
 GEOG 2007 Effects of Climate Change (7,5 credits) Autumn  
 GEOG 2009 Vector Based GIS (7,5 credits) Spring  
 GEOG3003 Methodology and the Research Process (7,5 credits) Autumn  
 GEOG3005 Qualitative Methods (7,5 credits) Autumn and Spring  
 GEOG3006 Quantitative Methods (7,5 credits) Spring  
 GEOG3505 Landscape and Planning (15 credits) Autumn  
 GEOG3515 Environment, Development and Changing Rural Livelihoods (7,5 credits) Autumn  
 GEOG3523 GIS Data Capture and Mapping, (7,5 credits), Spring  
 SØK3524 Environmental and Resource Economics (15 credits) Autumn and Spring  
 POL2022 Petroleum Management, Political Economy and Ethics (7,5 credits) Autumn  
 FI5207 Multicultural Conflicts and Ethics (7,5 credits) Spring  
 FI5205 Corporate Responsibility and Ethics (7,5 credits) Autumn  
 HIST3295 International Economic Contemporary History (7,5 credits) Autumn

**The list of the following courses can be elected by all students attending the international master programme MSc Natural Resources Management if you have the knowledge demanded in the course description. It is also possible to choose other courses apart from this list according to specific interest and in agreement with the supervisor and responsible Department.**

Examples of Master's thesis in Natural Resources Management

#### **Specialization Biology:**

##### **2009:**

**Borecha Degitu Endale:** Human-elephant conflict: a study in Babile Elephant sanctuary, Ethiopia

**Pokharel Bimal:** Livelihood impact of hydropower development and river diversions in the downstream of river Basin: a retrospective case study of Khimti river, Eastern Nepal

**Vikanes Berit Haga:** Does the personal background of the caseworkers influence natural resource management decisions?

**Welesamiel Mengstab Tilahun:** Optimization of on-site treatment systems: filtration using geo-textile filters for source separated black wastewater

##### **2011:**

**Bentsen Vidar Johan:** Density dependent habitat use of Atlantic salmon, *Salmo salar* L.-stranding in hydropower rivers

**Dhuli Priyanka:** Metabolite changes in conifer buds and needles during bud break - Norway spruce (*Picea abies*) and European silver fir (*Abies alba*)

**Kvistad Arne Ivar:** Why Do Some Areas Have Higher Density of Forest Grouse Than

Others?

**Lyamuya Richard Daniel:** Human-carnivore conflict over livestock in the eastern Serengeti ecosystem with special emphasis on African wild dogs (*Lycaon pictus*)

**Marealle Wilfred Njama:** Factors affecting group size and vigilance behaviour of Maasai giraffe (*Giraffa camelopardalis tippelskirchi*) in the Serengeti-Ngorongoro ecosystem, Tanzania

**Peter Mramba Rosemary:** Nutritional Status of Children as an Indicator of Bushmeat Utilization in Western Serengeti

**Sandberg Erin Christina:** Do moose adjust their behavior following wolf recolonization?: the case of bedsite habitat selection

**2012:**

**Bunikyte Raimonda:** An assessment of gains in conservation: A case study in Sør-Trøndelag, Norway

**Fliflet Henrik Rasmussen:** Spatial and Temporal Variation in Moose- (*Alces alces*) Road Crossings

**Hansen Suzanne:** Red-listed vascular Plant Species in Sub-Alpine and Alpine Landscapes: How does Land-use affect their Distribution?

**Lamsal Saraswati:** The park-people conflict in the Chitwan National Park with reference to the Asiatic one-horned rhinoceros (*Rhinoceros unicornis*)

**Morales Julio:** Patterns of Distribution of Paspalum species along environmental gradients landscapes in the Nicaraguan Dry Tropical Forest

**Paul Ajit Kumar:** Environmental degradation and loss of traditional agriculture as two causes of conflicts in shrimp farming in southwest coastal Bangladesh: present status and probable solution

**Roalsø Erik Roall:** Alien plant species in Svalbard

**2013:**

**Hariohay Kwaslema Malle:** Impacts of human settlements and land use changes in Kwakuchinja wildlife corridor, Northern Tanzania

**Hossen Amir:** Human-elephant conflict in Bangladesh; causes and intensity of fatalities.

**Huseby Oddmund:** Spatio-temporal variation in moose-vehicle collisions: the effect of varying traffic intensity and light conditions

**Manyama Flora:** Factors affecting the attitudes of the local inhabitants of the Kondoa District-Tanzania, toward the red-billed quelea (*Quelea quelea*)

**Ofstad Endre:** Seasonal Variation in Site Fidelity of Moose (*Alces alces*)

#### **Specialization Resource Geology:**

**2012:**

**John Bitebe Kangeze:** Ore forming potential of the Atchiza Suite and Sustainable management of mineral deposits in Mozambique

#### **Specialization Geography:**

**2009:**

**Pathamanandakumar Vyddiyartnam:** The impacts of Ecotourism in Maussawa Estate, Sri Lanka.

**2011:**

**Egbert Jacob Holtrop:** User conflicts and management of Urban Woodlands-The case of Trondheim, Norway and Arnhem, The Netherlands.

**2012:**

**Phung Thi Nguyen:** Causes of forest conflicts- Case study of three districts in Lam Dong province, Vietnam

**David Mugambi Mbuba:** Impact of Participatory Foreste Management on Livelihoods; A Case of Arabuko Sokoke Foreste along the Kenyan Coast.

**Elvise Ngome Kome:** Assessing the Participation of Stakeholders in Natural Resource



Management- A Case of the Fako Mountain Forest, Cameroon.

**Muhammed Niyas Fathirma Muneera**: Public- Private Partnership (PPP) in Solid Waste Management- Literature Review of experiences from Developing Countries with special attention to Sri Lanka.

**2013:**

**Nana Yaa Owusu-Banahene**: Oil versus Fish: A Study of the Conflict between Different Resources Users in the Marine Commons of Cape Three Points- Ghana.

**Benno Rummel**: Investigation of Landsat satellite image change detection of snow and ice cover- A seasonal and multi annual time scale approach to evaluate this technique as a tool for water resource management.

**Jerome Jeffison Yaw Ofori**: The role of Information Accessibility in achieving Transparency and Accountability in Ghana's oil Industry- A reality check from Cape Three Point.

**Sasikumar Kumarasamy**: Environmental and Economic Impact of Mangrove Deforestation- Case study of Vadamaradchy East, Sri Lanka.

**Anne Guri Aase**: A New Approach Towards Comparing Environmental Impacts From Small-Scale Hydropower, Large-Scale Hydropower and Wind Power.

**Ashok Baniya**: Response to Impact of Climate Change through Community Manged Forests in Nepal: Is REDD + Panacea for community?

**Øistein Løvstad**: Transboundary Water Management- The Case of the Kikagati/Murongo Hydropower Development Project.

Special information about the Master's Study

### Workload and Structure

The programme requires two years of full-time study, beginning with the autumn term (medio August). The normal work load for a full-time student for one academic year is 60 ECTS credits.

The Master's study consists of two parts:

1. A written thesis of the project (Master's thesis). The extent of the assignment should correspond to a work load of 60 credits. The work on the thesis is time limited. The thesis have to be submitted within May 15<sup>th</sup> of the 2<sup>nd</sup> year, while the students at the specialisation Geography have to submit the thesis May 10<sup>th</sup> of the 2<sup>nd</sup> year.
2. An approved selection of courses, of a minimum of total of 60 credits, from what (at least) 30 credits must be courses at 3000-level (master level) (UTF§14.1).

### Master's agreement

Every master student has to sign a Master's Agreement. This agreement comprises your syllabus and master project together with regulations for the counselling given during the Master's study. The courses, compulsory or elective, stated as syllabus in your Master's Agreement cannot be changed. If there for serious reason develops a need for change, the Master's Agreement must be revised. The supervisor, the responsible institute and the student must agree upon the revision and the new Agreement filed.

### The Master's thesis

The Master's thesis should be developed as your own original work (with some support from your adviser). Any quotation, use of data, information etc from other sources (including the scientifically litterature and your fellow students) should therefore be carefully listed and included in the reference list of your thesis, according to the best practice within your field of study. *There is no tolerance for plagiarism which will result in not achieving the degree.*

### Submission and Examination

The student has to:

- Register for the final Master's Degree examination (through STUDWEB) within February the 15<sup>th</sup> of the 2<sup>nd</sup> academic year
- Apply for approval of your individual special syllabus if your Master's Agreement demands a special syllabus. It is important that this is done well in advance of the examination. A study committee will evaluate the syllabus, and if it is not accepted, you must change it. Your supervisor must approve and sign the form. The syllabus should be a minimum of 50 pages per credit.
- Submitting the thesis (within the deadline given, (see below) for printing through DAIM *except for the geography students*, who need to contact the Department of Geography or check this link <http://www.ntnu.edu/geography/master-thesis>. The Department will give you 5 copies of the thesis. In addition to the evaluation of the thesis, the candidate will have an oral examination consisting of:
  - A conversation on/presentation ("defence") of the research assignment (the Master's thesis)
  - Examination on the theoretic syllabus of the advanced courses which has previously not been evaluated during the study (at least 7,5 credits, preferentially individual special syllabus). All examinations, except the Individual Special Syllabus (if any) have to be passed before the date of the final Master's Degree examination, unless otherwise stated in your Master's Agreement.
- A grade is given for every course / special syllabus that constitutes a part of the final Master's Degree examination.

### Important deadlines

- **15<sup>th</sup> of October (1<sup>st</sup> year)**: Decide on a Master's project in cooperation with the supervisor. Geography students have to check with the Geography Department for their process.
- **1<sup>st</sup> of November (1<sup>st</sup> year)** Biology students have to register their Master's Agreement in DAIM and hand in the project description. Geography students have to follow the routine at the Department of Geography to hand in the project description and the Master's Agreement, which is not DAIM for the Geography students.
- **15<sup>th</sup> of February (2<sup>nd</sup> year)**: Deadline for the signing up for the final Master's Degree exam (through STUDWEB)
- **10<sup>th</sup> of May (2<sup>nd</sup> year)**. Deadline for the submission of the Master' thesis for the geography students
- **15<sup>th</sup> of May (2<sup>nd</sup> year)**. Deadline for the submission of the Master' thesis for biology and chemistry students
- Resource geology students have to contact the Department of Geology and Mineral Resources Engineering for individual agreement for delivering.
- If the thesis is not submitted within this date the grade "not passed" will be awarded, unless there is handed in an application for extension of the deadline in reasonable time before the deadline. The reasons given in the application must be in accordance with Supplementary Regulations for the Natural Sciences (UTF) § 20.3 and the Examination Regulations at NTNU, § 20. Alternatively such an application may be dealt with, taken into consideration The Supplementary Regulations for the Natural Sciences (UTF) § 7 and the Examination Regulations at NTNU, § 7. See below for further information regarding §7 and §23.3.
- **15<sup>th</sup> of June (approximately, 2<sup>nd</sup> year)**: is the date for the final Master's Degree exam. There will be individual agreement with the respective Department, approximately four weeks after the thesis is submitted.

### Leave of absence from the Master's Study (UTF § 7) (extract):

- a) Leave of absence from the master studies of two years of duration and from the two last year of master studies of five years of duration is normally not granted.
- b) Leaves of absence may nevertheless be granted when applied for and compelling circumstances are present. Such circumstances might be illness (yourself or among close family member) etc.

**Prolongation of the study (UTF § 20.3) (extract):**

Time for the Master's study is limited. In case of illness, the deadline for submitting the thesis can be postponed equivalent to the time of absence due to illness. The illness must be documented by medical certificate.

If there is a valid reason for not submitting the thesis in time, one can apply for up to three months prolongation of the deadline. If the thesis is not submitted within the extended deadline, a new extension must be applied for, or else the candidate is regarded failed. The delay of deadline can only be applied for twice.

Valid reasons for postponement (in addition to illness) is teaching, organized student activity, social work and unmerited problems concerning the thesis. Written documentation or statement is required, in addition to a new plan of completion. The Faculty of Natural Sciences and Technology (NT-Faculty), or the Department when given the assignment by the NT-Faculty, determines the application. When the reason for delay is teaching, organized student activity or social work, the extended time given is according to the time spent on these activities.

The agreed delay has no influence on the evaluation of the thesis.