

Report on master curricula best practices in EU partner countries

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1 Introduction

The risk management of natural disasters requires well-developed professionals with appropriate knowledge. It is the responsibility of national institutions including universities to educate the mentioned specialists. In a few European member states special master curricula dealing with natural disaster risk management have been established. Other member states in turn have included appropriate courses in existing master curricula. Information about the education of well-developed professionals in EU countries and a list of relevant curricula or courses are outlined.

2 Analysis of EU master curricula

Information about existing master curricula in EU countries is indispensable for developing master curricula for risk management in Western Balkan regions. In work package 1.3 (WP 1.3) a collaboration between BOKU and all partners from EU countries is foreseen to close the knowledge gap concerning master curricula. In the following chapters several existing master curricula are documented for different EU countries.

2.1 Austria

2.1.1 Overview

In Austria a few master's degree programmes related to natural disaster risk management are available at different universities (Table 1).

Table 1: Relevant master's programmes in Austria

Master's programme	Academic degree	University
Alpine Natural Dangers / Watershed Regulation	MSc	University of Natural Resources and Life Sciences, Vienna
Civil Engineering and Water Management	MSc	University of Natural Resources and Life Sciences, Vienna
Geotechnical and Hydraulic Engineering	MSc	Graz University of Technology
Civil Engineering	MSc	Vienna University of Technology

2.1.2 Alpine Natural Dangers / Watershed Regulation (AND), University of Natural Resources and Life Sciences, Vienna (BOKU)

In the master's degree programme "Alpine Natural Dangers / Watershed Regulation" of the University of Natural Resources and Life Sciences Vienna (BOKU, 2015) the students acquire the necessary knowledge and skills for a responsible handling of hazards in alpine regions. In order to achieve the educational objectives, the program is oriented towards the cycle of "integral risk management" including sustainable coping, rebuilding and prevention measures. In addition to scientific and technical courses, questions of natural hazard legislation, spatial planning, disaster prevention and management are an essential part of the study program.

Occupational fields

Graduates of the master's degree programme "Alpine Natural Dangers / Watershed Regulation" are prepared for employments in the following fields of activities:

- Evaluation and analysis of hazards and mass movements in alpine regions
- Prevention of alpine natural hazards
- Integrated river basin management
- Risk prevention
- Disaster management

3-pillar-principle

The characteristic of each master's degree programme at the University of Natural Resources and Life Sciences is the "3-pillar-principle", which ensures a minimum percentage of 15% of courses in each of the following scientific areas:

- Engineering sciences
- Natural sciences
- Economic, social and legal sciences

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken. The courses are subdivided into the following classification:

- Compulsory courses: 22 ECTS
- Master thesis: 30 ECTS
- Elective courses: 50 ECTS
- Free elective courses: 18 ECTS

Due to the fact that the entire master's degree programme is related to risk management, all potential courses are listed in Table 2.

Table 2: Courses of the master's degree programme "Alpine Natural Dangers / Watershed Regulation"

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Compulsory courses					
Hydrological hazards - analysis and assessment	SE	AND	Hübl J, Bernhardt M, Kaitna R	Institute of Mountain Risk Engineering (IAN)	3
Hydrological hazards - mitigation measures	L	AND	Hübl J, Habersack H, Schober B	Institute of Mountain Risk Engineering (IAN)	3
Runoff formation in torrential headwater basins	SE	AND	Holzmann H, Hübl J	Institute of Water Management, Hydrology and Hydraulic Engineering (IWHW)	2
Snow and avalanche hazards - analysis and evaluation	L	AND	Reiweger I (Heil K), Fischer J (Eberl A)	Institute of Mountain Risk Engineering (IAN)	3
Technical protection measures: avalanches	L	AND	Sauermoser S	Institute of Mountain Risk Engineering (IAN)	3
Landslide hazards	SE	AND	Mergili M, Straka W, Zangerl C	Institute of Applied Geology (IAG)	3
Hazards due to mass movements - rockfall	L	AND	Brauner M	Institute of Applied Geology (IAG)	3
Master's thesis seminar	SE	AND	Bergmeister K, Drexel A, Fiebig M, Florineth F, Fuchs S, Hübl J, Kaitna R, etc.	Institute of Mountain Risk Engineering (IAN)	2
Elective courses					
Silviculture and forest protection	L	AND	Lexer M, Vacik H, Netherer S	Institute of Silviculture (WALDBAU)	5
Mountain forest ecosystems	SE	AND	Katzensteiner K	Institute of Forest Ecology (IFE)	3
Design of protection works	L	AND	Suda J	Institute of Structural Engineering (IKI)	4
Fundamentals of geotechnical engineering	L	AND	Wu W	Institute of Geotechnical Engineering (IGT)	4
Environmental aspects in the flood protection	L	AND	Merwald I	Institute of Mountain Risk Engineering (IAN)	3
Aquatic ecology and river morphology	L	AND	Hauer C, Seliger C	Institute of Hydrobiology and Aquatic Ecosystem Management (IHG)	3
Construction methods and management for barrier structures	SE	AND	Wehrmann H	Institute of Structural Engineering (IKI)	2
Structural maintenance and monitoring	L	AND	Strauss A, Suda J	Institute of Structural Engineering (IKI)	2
Structural and objective based protection measures	L	AND	Hübl J, Strauss A	Institute of Structural Engineering (IKI)	4
Afforestation and forest protection near the timberline	L	AND	Halmschlager E, Klumpp R	Institute of Forest Entomology, Forest Pathology and Forest Protection (IFFF)	3
Soil bioengineering techniques	L	AND	Rauch J	Institute of Soil Bioengineering and Landscape Construction (IBLB)	2
Management of protective forests	L	AND	Hasenauer H, Seidl R	Institute of Silviculture (WALDBAU)	3
Wildlife ecology in protective and in selectively harvested forest stands	L	AND	Reimoser F	Institute of Wildlife Biology and Game Management (IWJ)	1.5

Spatial planning in alpine areas	L	AND	Seher W, Weiß G	Institute of Spatial Planning, Environmental Planning and Land Rearrangement (IRUB)	2
Natural danger law	L	AND	Wagner E	Institute of Law	2
Vulnerability and risk management	SE	AND	Fuchs S	Institute of Mountain Risk Engineering (IAN)	2.5
Introduction to natural hazard management	L	AND	Rudolf-Miklau F	Institute of Mountain Risk Engineering (IAN)	1.5
Civil protection	L	AND	Kaiser P	Institute of Mountain Risk Engineering (IAN)	1.5
Communication, information and participation	L	AND	Volgger S	Institute of Mountain Risk Engineering (IAN)	3
Forecasting and warning systems	L	AND	Hübl J	Institute of Mountain Risk Engineering (IAN)	1.5
Event documentation and damage analysis	L	AND	Hübl J	Institute of Mountain Risk Engineering (IAN)	1.5
Disaster management and emergency services	L	AND	Kreuzer S (Mayr B)	Institute of Mountain Risk Engineering (IAN)	1.5
Politics of natural hazards and risk governance	SE	AND	Rudolf-Miklau F	Institute of Mountain Risk Engineering (IAN)	1.5
Damage adjustment	L	AND	Holub M	Institute of Mountain Risk Engineering (IAN)	1.5
Watershed management	P	AND	Hübl J (Nagl G), Neumann M	Institute of Mountain Risk Engineering (IAN)	6
Dynamics of geophysical flows	SE	AND	Kaitna R	Institute of Mountain Risk Engineering (IAN)	3
Scenario development and analysis	L	AND	Mazzorana B	Institute of Mountain Risk Engineering (IAN)	2
Simulation models in natural hazards analysis	P	AND	Braitl S, Hübl J, Scheidl C	Institute of Mountain Risk Engineering (IAN)	3
Road network planning	SE	AND	Pertlik E (Holzfeind T, Santner C), Holzleitner F, Kühmaier M	Institute of Forest Engineering (FT)	5
Harvesting systems	SE	AND	Holzleitner F (Gruber P), Kanzian C	Institute of Forest Engineering (FT)	3

EX...Excursion; L...Lecture; LU... Laboratory Exercises; P/PE...Practical Exercises; SE...Seminar;

2.1.3 Civil Engineering and Water Management (CEWM), University of Natural Resources and Life Sciences, Vienna (BOKU)

The master's degree programme "Civil Engineering and Water Management" of the University of Natural Resources and Life Sciences, Vienna (BOKU, 2016) leads the students into the knowledge and working methods of applied natural sciences and their engineering applications. Graduates have a well-founded basic knowledge and a comprehensive understanding of sustainable use of natural resources. In addition, the ability of networked thinking in designing, planning, building and maintaining processes will be supported.

Occupational fields

Graduates of the master's degree programme "Civil Engineering and Water Management" are prepared for employment in the following fields of activities:

- Water management
- Land management, construction engineering and management

- Traffic and infrastructure management
- Waste management
- Geoinformation
- Risk management

3-pillar-principle

The characteristic of each master's degree programme at the University of Natural Resources and Life Sciences is the "3-pillar-principle", which ensures a minimum percentage of 15% of courses in each of the following scientific areas:

- Engineering sciences
- Natural sciences
- Economic, social and legal sciences

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken. The courses are subdivided into the following classification:

- Compulsory courses: 29 ECTS
- Master thesis: 30 ECTS
- Elective courses: 48 ECTS
- Free elective courses: 13 ECTS

Within the scope of elective courses four to six out of 13 subjects (Traffic and Transport planning, Geo Data Management, Land Management and Spatial Development, Risk Management and Resource Protection, Hydrology and Water Management, Hydraulic Engineering and River Management, Structural Design and Construction Industry, Structural Safety and Reliability Assessment, Aquatic Ecology, Sanitary and Industrial Water Management, Soil Water Management, Geotechnics and Applied Geology, Waste Management) have to be selected with at least 8 ECTS each. The subject of Risk Management and Resource Protection, including courses related to natural risk management, and all essential compulsory courses are listed in Table 3.

Table 3 Compulsory courses and selected elective courses of the master's degree programme "Civil Engineering and Water Management"

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Compulsory courses					
Construction and plane load-bearing structures	L	CEWM	Bergmeister K (Felderer C), Schwenn M (Lanik S), Stierschneider E (Mitterlehner S), Strieder E, Zeman O	Institute of Structural Engineering (IKI)	4
Applied geotechnical engineering	L	CEWM	Wu W (Brandmaier M), Acharya M	Institute of Geotechnical Engineering (IGT)	4
Hydromechanics	L	CEWM	Tritthart M (Brandmaier M), Nolz R (Wildt D)	Institute of Hydraulics and Rural Water Management (IHLW)	4
Special administrative law for civil engineering	SE	CEWM	Mittermüller B (Fürmann M), Werinos-Sydow S	Institute of Law	4
Strategic planning, decision support, and mediation	SE	CEWM	Hössinger R (Wiesmann T), Aschauer F	Institute for Transport Studies (IVe)	3
Natural hazards	L	CEWM	Kaitna R	Institute of Mountain Risk Engineering (IAN)	2
Construction project (optional interdisciplinary)	P	CEWM	Cepuder P, Ertl T, Fürst J, Langergraber G, Mader H, Mayr E, etc.	Department of Water - Atmosphere - Environment, Department of Landscape, Spatial and Infrastructure Sciences, Department of Civil Engineering and Natural Hazards	6
Master's thesis seminar	SE	CEWM			2

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Elective courses (selected)					
Risk Management and Resource Protection					
Integrated flood risk management	L	CEWM	Holzmann H, Habersack H, Schober B	Institute of Water Management, Hydrology and Hydraulic Engineering (IWHW)	3
Sustainability, Protection of Resources and Natural Hazards (compulsory in the module)	L	CEWM	Fiebig M	Institute of Applied Geology (IAG)	3
Protection and mitigation measures against natural hazards	L	CEWM	Hübl J (Mögele C)	Institute of Mountain Risk Engineering (IAN)	3
Risk management and vulnerability assessment	SE	CEWM	Papathoma-Köhle M, Thaler T	Institute of Mountain Risk Engineering (IAN)	3
Landslide hazards	SE	CEWM	Mergili M, Straka W, Zangerl C	Institute of Applied Geology (IAG)	3
Environmental risks - introduction to risk analysis	L	CEWM	Gazsó A	Institute of Safety and Risk Sciences	2
Technology assessment	SE	CEWM	Liebert W, Drapalik M, Gufler K	Institute of Safety and Risk Sciences	3
Environmental statistics	L	CEWM	Laaha G (Schlögl M)	Institute of Applied Statistics and Computing (IASC)	3
Soil water protection	L	CEWM	Cepuder P	Institute of Hydraulics and Rural Water Management (IHLW)	2
Soil protection	L	CEWM	Wenzel W	Institute of Soil Research (IBF)	3
Development and application of water erosion models	L	CEWM	Klik A	Institute of Hydraulics and Rural Water Management (IHLW)	2

2.1.4 Geotechnical and Hydraulic Engineering (GHE), Graz University of Technology (TU Graz)

The master's degree programme in "Geotechnical and Hydraulic Engineering" established at TU Graz provides students with an in-depth education in engineering, focussing on the field of civil engineering and its application and, through the three separate specialisation subjects offered, Soil Mechanics, Rock Mechanics and Hydraulic Engineering, is oriented towards the current international development of engineering subdisciplines. The degree programme reflects the principle of research-led teaching. In addition to providing detailed specialist, theoretical knowledge, particular focus is laid on providing practical, social and media competencies. In extended exercises in laboratories and outdoors as well as on excursions, students learn to independently develop concepts and to put them into practice (TU Graz, 2015)

Occupational fields

Graduates of the master's degree programme "Geotechnical and Hydraulic Engineering" are prepared for employments in the following fields of activities:

- Geotechnics
- Soil mechanics
- Foundation engineering
- Rock mechanics
- Tunnelling

- Hydraulics
- Hydraulic engineering
- Urban water management

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken. The courses are subdivided into the following classification:

- Compulsory courses: 27.5 ECTS
- Master thesis: 30 ECTS
- Elective courses: 50.5 ECTS
- Elective courses (soft skills): 6 ECTS
- Free elective courses: 6 ECTS

Within the scope of elective courses two out of three subjects (Soil Mechanics, Rock Mechanics and Hydraulic Engineering) have to be selected. The subject Hydraulic Engineering, including courses related to natural risk management, and all essential compulsory courses are listed in Table 4.

Table 4 Compulsory courses and selected elective courses of the master's degree programme "Geotechnical and Hydraulic Engineering"

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Compulsory courses					
Engineering Geological Investigation	L	GHE	Bitenc M, Harer G, Kieffer D	Institute of Applied Geosciences	3
Finite Element Method	L	GHE	Fries T, Steidl J	Institute of Structural Analysis	3
Geotechnical Monitoring	L	GHE	Ehrhart M, Lienhart W	Institute of Engineering Geodesy and Measurement Systems	4
Hydraulic Engineering	L	GHE	Zenz G, Shahriari S	Institute of Hydraulic Engineering and Water Resources Management	4
Hydraulics 1	L	GHE	Zenz G	Institute of Hydraulic Engineering and Water Resources Management	1.5
Hydraulics 1	SE	GHE	Knoblauch H	Institute of Hydraulic Engineering and Water Resources Management	1.5
Petrology	PE	GHE	Hippler D, Klammer D	Institute of Applied Geosciences	1
Petrology	L	GHE	Hippler D, Klammer D	Institute of Applied Geosciences	1.5
Rock Mechanics and Tunnelling	L	GHE	Pötsch M, Schubert W	Institute of Rock Mechanics and Tunnelling	4
Soil Mechanics and Foundation Engineering	L	GHE	Ausweger G, Marte R, Pichler P, Schweiger H	Institute of Soil Mechanics and Foundation Engineering	4

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Elective courses (selected)					
Hydraulic Engineering					
Field Excursion Hydraulic Engineering	P	GHE	Schneider J, Hammer A, Shahriari S, Staudacher E	Institute of Hydraulic Engineering and Water Resources Management	1.5
Fundamentals of Grouting	L	GHE	Kieffer D, Marte R	Institute of Applied Geosciences	3
Geotechnical Earthquake Engineering	L	GHE	Kieffer D, Lee H	Institute of Applied Geosciences	3
Hydraulics 2	L	GHE	Zenz G, Knoblauch H	Institute of Hydraulic Engineering and Water Resources Management	6
Hydrology	L	GHE	Muschalla D, Krall E	Institute of Urban Water Management and Landscape Water Engineering	3
Management of Risks and Disasters	L	GHE	Hammer A	Institute of Hydraulic Engineering and Water Resources Management	4
Master Project Hydraulic Engineering	SE	GHE	Knoblauch H, Schneider J, Hammer A, Shahriari S, Staudacher E	Institute of Hydraulic Engineering and Water Resources Management	5
Project Planning and Supervision of Hydraulic Structures	L	GHE	Zenz G, Hammer A	Institute of Hydraulic Engineering and Water Resources Management	5
River and Sediment Hydraulics	L	GHE	Knoblauch H, Schneider J	Institute of Hydraulic Engineering and Water Resources Management	3
Seismic Evaluation of Water Retention Structures	L	GHE	Zenz G, Shahriari S	Institute of Hydraulic Engineering and Water Resources Management	3
Testing Technology and Laboratory Tutorial in Hydraulics	P	GHE	Schneider J, Shahriari S	Institute of Hydraulic Engineering and Water Resources Management	4

2.1.5 Civil Engineering (CE), Vienna University of Technology (TU Wien)

The master's degree programme in "Civil Engineering" of Vienna University of Technology (TU Wien, 2013) provides students with an in-depth education in engineering, focussing on the field of civil engineering and its application. The degree programme reflects the principle of research-led teaching. In the scope of the master's degree programme attention is given to an interdisciplinary education supporting technical engineering, cognitive and practical as well as social and innovative competencies.

Occupational fields

Graduates of the master's degree programme "Civil Engineering" are prepared for employments in the following fields of activities:

- Structural engineering
- Geotechnics
- Construction management
- Traffic and mobility
- Water & resources

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken. The courses are subdivided into the following classification:

- Compulsory courses: 52 ECTS
- Master thesis: 30 ECTS
- Elective courses: 21 ECTS
- Project: 8 ECTS
- Free elective courses (+soft skills): 9 ECTS

Within the scope of compulsory courses two out of six subjects (Structural Engineering I, Structural Engineering II, Geotechnics, Soil Mechanics, Construction Management, Traffic and Mobility, Water and Resources) have to be selected. The subject of Geotechnics, including courses related to natural risk management, is depicted in Table 5.

Table 5 Selected compulsory courses of the master's degree programme "Civil Engineering"

Title	Type	Master curriculum	Lecturer	Organisation	ECTS credits
Compulsory courses (selected)					
Geotechnics					
Rock Engineering and Tunneling	L	CE	Adam D	Institute of Geotechnics	2.5
Soil mechanics and geotechnical engineering 2	LU	CE	Blovsky S	Institute of Geotechnics	2
Soil Dynamics	L	CE	Adam D, Kopf F	Institute of Geotechnics	1
Ground exploration and rock classification	SE	CE	Hofmann R, Bilak A	Institute of Geotechnics	2.5
Applied rock mechanics	L	CE	Poisel R, Preh A	Institute of Geotechnics	3
Applied and technical petrology	L	CE	Rohatsch A	Institute of Geotechnics	2
Geotechnics and Natural Hazards	SE	CE	Hofmann R	Institute of Geotechnics	2
Ground Engineering and Soil Mechanics 2	L	CE	Adam D	Institute of Geotechnics	3
Special foundations	L	CE	Breit K	Institute of Geotechnics	2
Geosynthetics in Civil Engineering	L	CE	Oberreiter K	Institute of Geotechnics	2
Environmental geotechnics	L	CE	Brandl H	Institute of Geotechnics	2.5
Applied rock mechanics	SE	CE	Preh A	Institute of Geotechnics	2
Applied and technical petrology	LU	CE	Rohatsch A, Ban M	Institute of Geotechnics	2
Restoration and conservation of buildings and objects made stone	SE	CE	Rohatsch A, Ban M	Institute of Geotechnics	1.5
Finite Difference Modelling in Geoen지니어ing	SE	CE	Preh A	Institute of Geotechnics	2.5
Geology and traffic constructions	L	CE	Bilak A	Institute of Geotechnics	3
Underground excavation design	SE	CE	Zettler A	Institute of Geotechnics	1.5
Applied rock mechanics	EX	CE	Poisel R	Institute of Geotechnics	2

2.2 Greece

2.2.1 Overview

Greece has one master been developed dealing with natural disasters and risk management (Table 6).

Table 6: Relevant master's programmes in Greece

Master's programme	Academic degree	University
Analysis and management of man-made and natural disasters	MSc	Technological Educational Institute of Eastern Macedonia and Thrace and Fire Brigade Academy

2.2.2 Analysis and management of man-made and natural disasters, Technological Educational Institute of Eastern Macedonia and Thrace (TEI-EMT)

The Technological Educational Institute of Eastern Macedonia and Thrace, together with the Fire Brigade Academy created in October 2015 a new interdisciplinary, interinstitutional Master Programme entitled "Analysis and management of man-made and natural disasters". Within this programme, four departments of the TEI-EMT are cooperating (namely the Department of Forestry and Natural Environment Management, the Department of Petroleum and Gas Engineering and Technology - Mechanical Engineering, The Electrical Engineering Department and the Management Department) as well as the School of Lieutenants in the Fire Academy. The MSc programme is addressed mainly to officers of the Greek Fire Brigade Corp and to civil servants working at the Civil Protection Departments, on modern methods against hazards coming from natural and man-made disasters. The program is open to officers and lieutenants of other Greek Armed Forces, to civil servants working in civil protection departments (holding an undergraduate degree, preferably in engineering), as well as to foreign students.

The topics presented include:

- Management of threats, crises and catastrophes (Disasters and environment, evaluation of threats, scale issues),
- Social and economic consequences of disasters
- Natural processes, threats and disasters (geological disasters, rivers and torrents, coast disasters, stonefalls, earthquakes, volcanoes, climate changes, weather disasters, open-air fires, both agricultural and forest).
- Environmental threats and technological disasters (environmental threats, technological disasters, chemical, biological nuclear threats).
- Electro-mechanical disasters.
- Oil leakage and spills, fires due to fires involving hydrocarbon materials.
- Technical means to reduce the risk (Structural identification in classical and historical-monumental buildings, elementary structural analysis, evaluation of structural risks, earthquake response of structures, flood effects reduction in rivers and torrents, fire fight, regulations, medical first-aid design).
- Usage of geoinformatics on disaster management (surveyance systems, G.P.S.).

- Civil protection mechanism according to European Union rules.

Students of the MSc programme follow a three semester full-time programme, from which the third semester is devoted to the graduate diploma thesis.

Highlights of the program are:

- realistic education in a Control room equipped with emergency risk simulators
- on-site On shore and off shore oil platform education
- usage of augmented reality techniques
- solid theoretical background

Further information related to the programme can be found (mainly in Greek) in <http://mandisastermsc.teiimt.gr/index.php>

2.3 Hungary

2.3.1 Overview

In Hungary there are just few educational institutes for risk management professionals in specialisation for natural disasters. Only two Universities in Hungary have specialisation for surface water management and risk management for environmental object. The three courses are not in master programme, just in a post-graduate programme (Table 7).

Table 7: Relevant master’s courses in Hungary

Title	Type	Lecturer	Organisation	ECTS credits
Flood modelling and risk mapping	Subject in a post-graduate course	Dr. Jozsa Janos	BME, Department of Hydraulic and Water Resources Engineering	6
Biostatistics, probabilistic models and risk management I	Subject in a post-graduate course	Ittzes Andras	Szent Istvan University, Faculty of Horticultural Science	5
Biostatistics, probabilistic models and risk management II	Subject in a post-graduate course	Ittzes Andras	Szent Istvan University, Faculty of Horticultural Science	5

2.4 Italy

2.4.1 Overview

An overview about relevant master’s programmes in Italy related to natural disaster risk management is given in Table 8. Masters mentioned with “Postgraduate” can only be enrolled by graduates, who have already finished another master programme related to the mentioned topics.

Table 8: Relevant master's programmes in Italy

Master's programme	Academic degree	University
Territorial risk management	MSc	University of Messina
Geoenvironmental resources and risks	MSc	University of Camerino
Civil Engineering for Risk Mitigation CERM	MSc	Polytechnic of Milan
Environmental risks and Civil Protection	MSc	Marche Polytechnic University
Civil and Environmental Engineering	MSc	University of Genoa
Engineering for natural and anthropic risks	MSc	University of Basilicata
Engineering Geology, Land Use Management and Georisks	MSc	University of Rome "La Sapienza"
MEES - Master in Earthquake Engineering and Engineering Seismology	Postgraduate	School of Advanced Studies IUSS Pavia, University of Patras, University of Grenoble Alpes, Middle East Technical University
Master in Hydraulic Risk	Postgraduate	University of Cagliari, Interuniversity Consortium for Hydrology (CINID), Autonomous Region of Sardinia
Management of Hydrological and Meteorological Hazards-HYDROMETHAZARDS	Postgraduate	University of Thessaly, Hellenic Open University, Università degli Studi di Messina, Universitat de Barcelona
LARAM - LANDslide Risk Assessment and Mitigation	Postgraduate (only for PhD)	University of Salerno

2.4.2 Territorial risk management, University of Messina

The master's degree programme "Territorial risk management" of the University of Messina (2017) pursues objectives to natural and ecological issues, which have to be achieved by establishing the appropriate balance between the acquisition of basic knowledge and the ability to apply it in various working fields. Graduates will acquire knowledge about evaluating and managing risks in natural and aquatic environments. They will be able to assume operational roles in both public and private administrations, even in positions of responsibility and coordination.

Occupational fields

The main employment opportunities are represented by the self-employed or high-level employee in public or private sectors with the competence and responsibility in the area of protection and management of the land and the natural environment. They may work also in relation to the drafting and management of safety and emergency plans. The degree also gives you the opportunity for researching or teaching at universities or in schools.

2.4.3 Geoenvironmental resources and risks, University of Camerino

The master's degree programme "Geoenvironmental resources and risks" of the University of Camerino (2017) provides knowledge and practical expertise in the field of Earth Sciences related to the natural resources and the environmental hazards, aiming to form a geologist able to operate in: a) the study, exploration, exploitation and sustainable use of georesources (water, hydrocarbons, geomaterials, geothermal energy, b) the study of geological hazards (monitoring, evaluation, mitigation management, prevention).

Specialization areas

Graduates of the master's degree programme "Geoenvironmental resources and risks" are prepared for the following specialization areas:

- Geodynamics and global tectonics
- Hydrogeological hazard and territory planning
- Experimental petrology and volcanology
- Geochemistry and geomaterials
- Water and energy resources
- Disaster management
- Geoarcheology and archeometry

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken which are subdivided into the following classification (Table 9):

Table 9: Relevant courses for the MSc in Geoenvironmental resources and risks, University of Camerino

Title	Compulsory/optional
1st year	Compulsory course
Environmental chemistry	Compulsory course
Groundwater resources and hydrological hazard	Compulsory course
Advanced field geology	Compulsory course
Geomaterials	Compulsory course
Petroleum geology	Compulsory course
Geostatistics	Compulsory course
Elective activity	Optional course
2nd year	
Seismic hazard	Compulsory course
Volcanic hazard	Compulsory course
Geophysical prospection	Compulsory course
Thesis	Optional course

2.4.4 Civil Engineering for Risk Mitigation CERM, Polytechnic of Milan

The Master of Science programme "Civil Engineering for Risk Mitigation CERM" of Polytechnic of Milan (2017) is aimed at providing knowledge and expertise in the field of structural and non-structural measures for the mitigation of natural and anthropic hazards. It offers a synthesis of fundamental and advanced civil engineering tools for Risk Management, integrated by competences in different areas (land use planning, economics and finance, communication, law, psychology).

Specialization areas

Graduates in C.E.R.M. deal with the design of structures and of infrastructures, with planning, control and management of town and of land systems, and they are able to evaluate the environmental impact of structures and of infrastructures. They can find employment in construction, in design and in consultancy companies and they may have access to contests for positions in the Public Administration.

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken which are subdivided into the classification shown in Table 10. In the second year students must choose three thematic modules among the following.

Table 10: Relevant courses for the MSc in Civil Engineering for Risk Mitigation CERM, Polytechnic of Milan

Title	Compulsory/optional
1st year	Compulsory course
Numerical Methods for Partial Differential Equations	Compulsory course
Soil-Structure Interaction	Compulsory course
Tools for Risk Management	Compulsory course
Flood Risk	Compulsory course
Structural Analysis	Compulsory course
Fundamentals of Gis	Compulsory course
2nd year (modules)	
Engineering Structures for the Environment	Electives
Geo-Engineering Techniques for Unstable Slopes	Electives
Emergency Plans for Hydro-Geological Risk	Electives
Structure Retrofitting for Seismic and Exceptional Loads	Electives
Transport management in emergency planning	Electives
Hazards from Industrial Sites: Process Analysis and Risk Assessment	Electives
Emergency Plans for Hydro-Geological Risk	Electives
Structure Retrofitting for Seismic and Exceptional Loads	Electives
Thesis	

2.4.5 Environmental risks and Civil Protection, Marche Polytechnic University

The Master of Science in Environmental and Civil Protection Risk of Marche Polytechnic University (2017) aims to train graduates to analyse, interpret and manage the complex relationship between man and environment, as part of the sustainability issues of natural resources. Planning, coordination and management of civil protection activities are educated in this master programme. The training of students is heavily weighted towards issues of "risk". The course of study is a continuation of the undergraduate degree in Environmental and Civil Defence Control Science of this university, and is also directed to graduates of other undergraduate classes who want to deepen and extend knowledge on these issues. A distinctive feature of this course is the interdisciplinary approach to the study of natural processes, including extreme events and their impact on socio-economic systems. Students acquire specific skills for risk assessment (chemical, industrial, risk and fire prevention, geological risk, climate, biological, ecological,) and civil protection, both in the prediction, prevention and mitigation of extreme natural events, both in planning and emergency management (disaster risk reduction, GIS instruments in environmental and civil protection, integrated management of emergencies, medicine of major emergencies and disasters), as well as the deepening of disciplines and environmental issues (legislation and environmental monitoring, waste management and environmental remediation, nature conservation and

management of protected areas, certifications and environmental regulations, environmental and energy sustainability).

Skills and Specialization areas

Graduates of the master programme “Environmental risks and civil protection” should achieve the following skills and be prepared for mentioned specialization areas:

- Consultation in environmental monitoring and restoration of degraded ecosystems
- Ability to perform and coordinate monitoring and interpretation of results
- Develop tools for the spatial analysis of the socio-environmental processes
- Develop strategies for using energy in a sustainable way (both from renewable sources and fossil fuels)
- Coordinate and manage environmental emergencies and civil protection
- Communicating in a clear and unambiguous state of environmental emergency and civil protection services (media, planners, policy makers, legislators)
- Design and develop environmental education projects and civil protection
- To promote public activities aimed at preventing risks and promote a culture of risk prevention and environmental sustainability
- Writing research projects and funding requests

Occupational fields

The expected employment opportunities include access to:

- Public and private structures in charge of control and environmental protection, national and local authorities with civil protection functions
- Professional firms and consulting firms (alternative energy, occupational safety, etc.), ESCO (Energy Service Company)
- Public or private research structures applied to the study of the conditions of the environment and pollution problems (University, CNR, ENEA, etc.).
- Various types of industries (chemical, mining, manufacturing, electronics, biotechnology, etc.),
- public institutions (ministries, regions, municipalities)
- International agencies (United Nations, European Union, non-governmental agencies)

Scope and classification

In the scope of this master’s degree programme courses in the extent of 120 ECTS have to be taken within two years.

2.4.6 Civil and Environmental Engineering, University of Genoa

The inter-class MSc Programme (LM) in Civil and Environmental Engineering at the University of Genoa (2017) includes courses compatible with classes of Civil Engineering and Environmental Engineering. The courses in common are shared in order to promote a strong and fruitful interaction and to provide the students with a modern approach of constructing in terms of environmental sustainability and protection of the territory.

Professional engineers are allowed to use advanced, innovative, and experimental methodologies for design, construction management, evaluation and testing of complex structures.

During the second year students have to choose one of the following curricula:

- Buildings & Infrastructures
- Environment and Protection of the Territory

Skills and Specialization areas

After graduation, engineers will be able to operate in the following sectors:

- Design, construction and maintenance of civil and industrial structures, infrastructures, and their monitoring systems;
- Design, construction and maintenance of structures and monitoring systems for mountain slopes protection, waterways and coasts protection, ecosystems conservation.

Scope and classification

Each class consists of two years as follows:

- During the first year the main theoretical and scientific aspects of Civil Engineering will be studied, in order to be able to identify and solve complex problems with the most innovative systems available nowadays;
- During the second year more class-specific skills will be acquired, in order to be able to develop and design more complex projects and systems in specific areas of Civil and Environmental Engineering.

Occupational fields

The expected employment opportunities include access to:

- Self-employed professional engineer;
- Civil and environmental engineering design studios and enterprises;
- Construction and maintenance enterprises for civil works and infrastructures;
- Public and local administrations (technical boards);
- Public and private entities operating major infrastructural networks;
- Research centres.

2.4.7 Engineering Geology, Land Use Management and Georisks, University of Rome “La Sapienza”

The Master of Science in “Engineering Geology, Land Use Management and Georisks” of the University of Rome “La Sapienza” (2017) intends to form professionals, which are able to organize, coordinate and plan studies, surveys and interventions having as their object the territory, the resources connected to it and the constructions in their multiple aspects. In particular, the graduates effectively operate in the following sectors: i) identification of cause/effect relationships between construction of works, land and resources usage on one hand as well as geological and evolutionary responses of the environment and natural resources on the other; ii) evaluation and management of geological risks; iii) definition and management of territorial monitoring systems and ability to develop technological innovations in the field of remote data acquisition.

Occupational fields

The expected employment opportunities include access to:

- Professional firms and companies as coordinator and/or editor of projects and geological maps of national importance;

- Institutions and companies operating in the field of civil construction and the preservation or restoration and land reclamation
- National and regional agencies for environmental protection and territory, National Department of Protection Civil, Ministry of Environment, ISPRA, ARPA;
- Public institutions responsible for the planning and spatial planning (Municipalities, Provinces, Regions, Authority Basin, Mountain Communities) and the cycle management integrated water (optimal territorial authorities, acquedottistici consortia);
- Companies and institutions of national importance (ANAS, ENEL, ACEA, ENI, Italferr, RFI, Sogin, INAIL, Autostrade);
- Institutions and research organizations, and universities.

Scope and classification

In the scope of this master's degree programme courses in the extent of 120 ECTS have to be taken within two years.

2.4.8 Master in Earthquake Engineering and Engineering Seismology (MEES), consortium of 4 academic institutions

The MEEES programme is an Erasmus Mundus Masters Course, that aims to provide higher-level education in the field of Earthquake Engineering and Engineering Seismology. Graduate students involved in this Erasmus Mundus Masters course have the possibility of following a 18-month MSc programmes on either Earthquake Engineering or Engineering Seismology. In addition, the proposed EM Masters course envisages also the possibility of students following a 18-month study programme that leads to the attainment of a Masters degree on Earthquake Engineering and Engineering Seismology.

If following the Engineering Seismology option, students will acquire the ability to design, execute and evaluate assessments of seismic hazard for site-specific engineering projects, for earthquake loss assessments, and for emergency planning scenarios. Students following the Earthquake Engineering option will acquire the ability to undertake seismic design of new structures and the assessment and strengthening of existing structures. The combined option of Earthquake Engineering and Engineering Seismology will enable students to acquire technical competence in both areas.

The MEEES consortium comprises four academic institutions, namely (i) School of Advanced Studies IUSS Pavia), (ii) the University of Patras, (iii) the University of Grenoble Alpes and (iv) the Middle East Technical University. It is noted that the first institution runs the postgraduate earthquake engineering programme in Pavia, through the Centre for Post-Graduate Training and Research in Earthquake Engineering and Engineering Seismology (ROSE School). Hence in subsequent sections of this website, the term ROSE School is employed to refer to the activities of IUSS within the scope of the MEEES consortium.

Further information related to the programme can be found on <http://www.mees.org/site-pages/show/id/4>.

2.4.9 Master in Hydraulic Risk, University of Cagliari

The University of Cagliari has established the 1-year Master Course in Hydraulic Risk, in collaboration with the Universities of the Interuniversity Consortium for Hydrology (CINID) and with the support of the Autonomous Region of Sardinia. Objective of the master is to enhance the professional skills of graduates in science and technology, by acquiring their management capacity and mitigation of flood risks for the defense of the territory and protection of human activities. The training course is aimed at training professionals with technical skills of hydraulic risk prevention and mitigation, to operate in the areas of soil conservation, land use planning, civil protection and conservation and safeguarding of cultural heritage and environment.

Further information related to the programme can be found on <http://masterrischioidraulico.unica.it/>.

2.4.10 Master in HYDROMETHAZARDS, joint international programme of 4 universities

In the academic year 2017-2018 will start the Joint international Program of Postgraduate Studies "Management of Hydrological and Meteorological Hazards-HYDROMETHAZARDS" of the University of Thessaly, in collaboration with the Hellenic Open University, Università degli Studi di Messina and Universitat de Barcelona. The joint (distant learning) Postgraduate Master Program "Management of Hydrological and Meteorological Hazards-HYDROMETHAZARDS" will be able to admit 200 postgraduate students per year with the possibility of adjustment. The number of students admitted is indicative and it is subject to change after a justified proposal of the Academic Supervising Committee of the joint Postgraduate Master Program. The Postgraduate Program admits graduates of Greek and European Universities and Universities of third countries with a degree in Science and Engineering (e.g. Engineering, Natural and Environmental Sciences and Agriculture), who have accumulated at least 180 ECTS units or equivalent amount of other units.

2.4.11 Landslide Risk Assessment and Mitigation (LARAM), University of Salerno

LARAM is an International School on "LAndslide Risk Assessment and Mitigation" of the University of Salerno. LARAM is directed at PhD students working in the field of Civil Engineering, Environmental Engineering, Engineering Geology or similar Engineering background. (<http://www.laram.unisa.it/>)

Every year 40 students are selected to attend the School's Courses. The School is held annually. The Courses are residential and last 2 weeks.

The main objectives of LARAM are:

- to develop high educational interdisciplinary programs for assessing, forecasting and mitigating landslide risk over large areas;
- to promote the creation of "on the job" vocational training programs aimed at solving real landslide risk problems using the most advanced theories and methodologies in the

fields of geotechnical engineering, geomechanics, geology, mathematical modelling, monitoring, GIS techniques, etc.

2.5 United Kingdom

2.5.1 Overview

The overarching topic is very broad and therefore there may be many Masters level courses programmes which includes particular modules or units relating to assessing or managing natural risks. However, the analysis presented for the UK herein only focusses on those Masters Programmes which predominantly focus on natural disasters and/or their management (Table 11). The following information is provided following an internet search of the relevant programmes and their curricula undertaken in February 2017.

Table 11: Relevant master's programmes in the United Kingdom

Master's programme	Academic degree	University
Disasters, adaptation and development	MA/MSc	Kings College London
Risk and Disaster Science	MSc	Institute for Risk and Disaster Reduction, University College London
Risk and Disaster Resilience	MSc	Institute for Risk and Disaster Reduction, University College London
Risk and Disaster Reduction	MSc	Institute for Risk and Disaster Reduction, University College London
Disaster Management and Sustainable Development	MSc	Northumbria University
MA/MSc in Risk	MA/MSc	Durham University
Crisis and disaster management	MSc	University of Portsmouth
Disaster Management	MSc	Coventry University
Emergency Planning and Management	MSc	Coventry University
Risk Disaster and Environmental Management	MSc	University of Huddersfield
International Disaster Management	MSc	University of Manchester
Disaster Resilience and Management	MRes	University of Salford
Disaster Management for Environmental Hazards	MSc	University of South Wales
Crisis and Disaster Management	MSc	University of Lincoln
Risk, Crisis and Disaster Management	MSc	University of Leicester

2.5.2 Disasters, adaptation and development, Kings College London

This programme is offered as both MA and MSc and employs a pathway-led mode of teaching permitting students to specialise according to their interests. In general, the programme delivers a social development perspective to disaster risk reduction and provides a choice of many modules. The aim of the course is to “provide students with an in-depth and critical awareness of the politics and geographies of disaster risk reduction and its contribution to sustainable adaptation and disaster response.” (KCL, 2017)

Occupational fields

The course is suitable for those coming directly from an undergraduate degree as well as practitioners who wish to formalise their knowledge.

Scope and classification

In the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken (Table 12). The courses are subdivided into the following classification:

- Core dissertation module: 30 ECTS equivalent;
- Both the MA/MSc programmes have compulsory modules of 20 ECTS equivalent with the MSc having a further 10 ECTS;
- Optional modules: MA students take 40 ECT and MSc take 30 ECTS equivalent,

Table 12: Relevant courses for the MA/MSc in Disasters, adaptation and development, Kings College London

Title	Compulsory/optional	Lecturer	ECTS credits
Dissertation in Disasters, Adaptation and Development	Core (MA/MSc)	Pelling, M (lead), plus various	30
Practising Social Research	Compulsory (MA/MSc)	Various (not listed)	10
Disasters and Development	Compulsory (MA/MSc)	Pelling, M	10
Advanced Quantitative Spatial Methods in Human Geography	Compulsory (MSc)	Reades, J; Shiode , N.	10
Environmental Internship	Prescribed optional	Wiltshire, R.	10
Water Resources and Water Policy	Prescribed optional	Allan, T.; Mirumachi, N.	10
Environment, Livelihoods and Development in the ‘South’	Prescribed optional	Potts, D.	10
Environmental GIS	Prescribed optional	Mulligan, M.	10
Risk Communication	Prescribed optional	Löfstedt, R.	10
Critical Geographies of Terrorism	Prescribed optional	Mustafa, D.; Schofield, R.	10
Community, Vulnerability and Disaster Risk	Prescribed optional	Cannon, T.	10
Water, Security and the Environment	Prescribed optional	Mirumachi, N.	10
Climate Change and Culture	Prescribed optional	Hulme, M.	10
Climate: Science and History	Prescribed optional	Adamson, G.	10
A Practical and Theoretical Evaluation of Sustainable Development	Prescribed optional	van den Berg, R.D.	10

NB: The table illustrates the “prescribed optional modules for the course” of which students are required to obtain 10 ECTS. However, are free to obtain the remaining credits from a longer list of optional modules of equivalent (e.g. Masters) level. This list is too lengthy to detail.

2.5.3 Risk and Disaster Science, Institute for Risk and Disaster Reduction, University College London (UCL)

This is a science-based programme whereby students will “learn how to assess and quantify risk, reduce disaster risks and manage emergencies for natural and anthropogenic hazards, humanitarian and health crises, conflict and climate change” (UCL, 2017) and centres around five key themes: Science of Earth and Space Hazards, Understanding Vulnerability, Statistical and Modelling Tools, Managing Disasters and Multidisciplinary Holistic Approaches

Occupational fields

Graduates of the master’s degree programme “Risk and disaster science” are prepared for employment in the following fields of activities: insurance, catastrophe modelling, risk management, public policy, humanitarian development, NGOs, business continuity, government, emergency services, consultancy and academic research.

Scope and classification

In the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken (Table 13). The courses are subdivided into the following classification:

- Two compulsory core taught modules: 15 ECTS equivalent;
- Two compulsory taught skills modules: 15 ECTS equivalent;
- Two compulsory programme-specific core modules: 15 ECTS equivalent;
- Two optional taught modules: 15 ECTS equivalent;
- Independent Project: 30 ECTS equivalent.

Table 13: Relevant courses for the MSc in Risk and Disaster Science, Institute for Risk and Disaster Reduction, UCL

Title	Compulsory/optional	ECTS credits
Integrating Science into Risk and Disaster Reduction	Compulsory core	7.5
Emergency and Crisis Management	Compulsory core	7.5
Risk and Disaster Reduction Research Tools	Compulsory skills	7.5
Research Appraisal and Proposal	Compulsory skills	7.5
Earthquake Science and Seismic Risks	Compulsory programme specific	7.5
Space Weather Risks	Compulsory programme specific	7.5
Independent Project	Compulsory core	30
Catastrophe Risk Modelling	Optional	7.5
Digital Health: Epidemics and Emergencies	Optional	7.5
Decision and Risk Statistics	Optional	7.5
Conflict, Humanitarianism & Disaster Risk Reduction	Optional	7.5
Climate Risks to Hydro-ecological Systems	Optional	7.5
Seismic Risk Assessment	Optional	7.5

2.5.4 Risk and Disaster Resilience, Institute for Risk and Disaster Reduction, University College London (UCL)

This second programme from the Institute for Risk and Disaster Reduction (UCL) has a greater focus on how to manage disaster risk and aims to add to the professionalism of DRR. It suggests that “Through a multidisciplinary approach to risk and disaster reduction, you will learn to become a future leader driving policy change and innovation in order to preserve lives and sustain economies which could otherwise be destroyed or damaged by disaster...gain

expertise in analysing complex challenges and providing sustainable solutions.” (UCL, 2017) Five key themes are studied: Physical and Social Science of Natural and Anthropogenic Hazards, Understanding Vulnerability, Quantifying Risk, Managing Disasters and Multidisciplinary Holistic Approaches.

Occupational fields

Graduates of the master’s degree programme “Risk and Disaster Resilience” are prepared for employment in the following fields of activities: insurance, catastrophe modelling, risk management, public policy, humanitarian development, NGOs, business continuity, government, emergency services, consultancy and academic research.

Scope and classification

Similar to the previous MSc, in the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken (Table 14). The courses are subdivided into the following classification:

- Two compulsory core taught modules: 15 ECTS equivalent;
- Two compulsory taught skills modules: 15 ECTS equivalent;
- Two compulsory programme-specific core modules: 15 ECTS equivalent;
- Two optional taught modules: 15 ECTS equivalent;
- Independent Project: 30 ECTS equivalent.

Table 14: Relevant courses for the MSc in Risk and Disaster Resilience Institute for Risk and Disaster Reduction, UCL

Title	Compulsory/optional	ECTS credits
Integrating Science into Risk and Disaster Reduction	Compulsory core	7.5
Emergency and Crisis Management	Compulsory core	7.5
Risk and Disaster Reduction Research Tools	Compulsory skills	7.5
Research Appraisal and Proposal	Compulsory skills	7.5
Natural and Anthropogenic Hazards and Vulnerability	Compulsory programme specific	7.5
Emergency and Crisis Planning	Compulsory programme specific	7.5
Independent Project	Compulsory core	30
Conflict, Humanitarianism & Disaster Risk Reduction	Optional	7.5
Decision and Risk Statistics	Optional	7.5
Risk, Power and Uncertainty	Optional	7.5
Disaster Risk Reduction in Cities	Optional	7.5
Post Disaster Recovery	Optional	7.5
Adapting Cities to Climate Change in the Global South	Optional	7.5
Space Weather Risks	Optional	7.5
Earthquake Science and Seismic Risks	Optional	7.5
Risk and Contingency Planning	Optional	7.5
Perspectives on Terrorism	Optional	7.5

2.5.5 Risk and Disaster Reduction, Institute for Risk and Disaster Reduction, University College London (UCL)

The third programme offered by UCL is a research masters (MRes) which offers students the opportunity to undertake a greater degree of research. Specifically, the programme provides a multi-disciplinary perspective allows students to “acquire a broad overview of different hazards, how this affects decision-making, different approaches to implementing this

information in decision-making and how to plan and manage emergency and crisis scenarios.” (UCL, 2017)

Scope and classification

As would be expected for an MRes programme two thirds of this (90 ECTS) programme focuses on more independent-led research. The courses are subdivided into the following classification (Table 15):

- Two compulsory taught skills modules: 15 ECTS equivalent;
- Three optional taught modules: 22.5 ECTS equivalent;
- Independent Project: 52.5 ECTS equivalent.

Table 15: Relevant courses for the MRes in Risk and Disaster Reduction, Institute for Risk and Disaster Reduction, UCL

Title	Compulsory/optional	ECTS credits
Risk and Disaster Reduction Research Tools	Compulsory skills	7.5
Research Appraisal and Proposal	Compulsory skills	7.5
Independent Project	Compulsory core	52.5
Integrating Science into Risk and Disaster Reduction	Optional	7.5
Natural and Anthropogenic Hazards and Vulnerability	Optional	7.5
Emergency and Crisis Planning	Optional	7.5
Emergency and Crisis Management	Optional	7.5

2.5.6 Disaster Management and Sustainable Development, Northumbria University

The MSc in Disaster Management and Sustainable Development at Northumbria University focuses on real world problems and places an emphasis on students learning how to plan and respond to crises. A practical focus suggests that graduates “will develop the planning skills to help minimise impact ...and develop advanced knowledge, project management and analytical skills”. (Northumbria University, 2017)

Occupational fields

Graduates of the course have been employed in the following careers:

- UN;
- Governments;
- Development;
- Humanitarian aid organisations;
- Charities;
- Local authorities.

Scope and classification

Students are required to take both core and compulsory modules totalling 180 UK credits (90 ECTS) (Table 16). The courses are subdivided into the following classification:

- Five compulsory modules: 50 ECTS equivalent;
- Three optional taught modules: 10 ECTS equivalent;
- Independent research or work dissertation: 30 ECTS equivalent.

Table 16: Relevant courses for the MSc in Disaster Management and Sustainable Development, Northumbria University

Title	Compulsory/optional	ECTS credits
Approaches to Project Management	Compulsory core	10
Themes in Sustainable Development	Compulsory core	10
Disaster Risk Reduction and Response	Compulsory core	10
Health and Well-being in Disaster and Development	Compulsory core	10
Postgraduate Research Methods	Compulsory core	10
Research or Work Related Dissertation	Compulsory core	30
Integrated Emergency Management	Optional	10
Subject Exploration in Disaster and Development	Optional	10

2.5.7 MA/MSc in Risk, Durham University

The MA (DUR, 2017a) in Risk at Durham University focuses on the social dimensions of risk and resilience and includes various different types of risk including environmental and natural, climate and security risks. The MSc (DUR, 2017b) focuses on physical hazards and scientific training for understanding and quantifying hazards.

Scope and classification

For both programmes, students are required to take both core and compulsory modules totalling 180 UK credits (90 ECTS). However the MA/MSc programmes have a different selection of optional and core modules as highlighted in the following Table 17. The courses are subdivided into the following classification:

- Three compulsory taught modules: 30 ECTS equivalent;
- Optional taught modules: totalling 30 ECTS equivalent;
- Dissertation by research or vocational dissertation : 30 ECTS equivalent.

Table 17: Relevant courses for the MA/MSc in Risk, Durham University

Title	Compulsory/optional	ECTS credits
Understanding Risk	Compulsory core	15
Risk Frontiers	Compulsory core	7.5
Fundamentals of Risk Research	Compulsory core	7.5
Dissertation by Research (or) Vocational Dissertation	Compulsory core	30
Hydrological Hazards	Optional	15
Spatial and Temporal Dimensions of Hazard	Optional	15
Social Dimensions of Risk and Resilience	Optional	15
International Relations and Security in the Middle East	Optional	7.5
Strategic Asia: Policy and Analysis	Optional	7.5
European Security	Optional	7.5
Social Policy and Society	Optional	15

2.5.8 Crisis and disaster management, University of Portsmouth

The MSc in Crisis and disaster management at the University of Portsmouth (PORT, 2017) offers both theoretical grounding of disaster hazards, vulnerability and risk as well as focussing on planning and responding to emergencies. The course is endorsed by the UK Cabinet Office's Emergency Planning College (EPC) and as such the programme allows some exemptions for professionals who have previously attended EPC courses.

Occupational fields

The programme prepares graduates for careers in the sectors of emergency planning, crisis management or disaster response. Graduates of the master's degree programme "Crisis and

disaster management” are therefore prepared for employment in the following fields of activities:

- Contingency planning;
- Humanitarian aid organisations;
- Community resilience;
- Flood management;
- Military-civilian emergency liaison;
- (Re)insurance and risk management.

Scope and classification

In the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken (Table 18). The courses are subdivided into the following classification:

- Three compulsory taught modules: 45 ECTS equivalent;
- Optional taught modules: totalling: 15 ECTS equivalent;
- Independent research project : 30 ECTS equivalent.

Table 18: Relevant courses for the MSc in Crisis and Disaster Management, University of Portsmouth

Title	Compulsory/optional	ECTS credits
Disasters: Hazard, vulnerability and risk	Compulsory Core	15
Emergency management and planning	Compulsory Core	15
Disaster management: techniques and study visits	Compulsory Core	15
Research Project	Compulsory Core	30
Crisis management and governance	Optional	15
Humanitarian emergency response and recovery	Optional	15

2.5.9 Disaster Management, Coventry University

“The course aims to provide students with the research skills, knowledge and management expertise to deal with future crises, emergencies and disasters in the developed and developing world” (Coventry University, 2017a). A holistic view of managing disasters is presented with graduates being able to identify analysis, assess and manage risk and disaster issues and apply these from strategic perspectives within relevant policy and operational frameworks.

Occupational fields

Graduates of the master’s degree programme “Disaster Management” are prepared for employments in the following fields of activities: disaster management, risk assessment, community development, humanitarian assistance and capacity building;

Scope and classification

Full details of the programme were not provided online. However, the information provided about the course suggests that the following topics will be studied:

- Disaster risk reduction and development;
- Humanitarian theory and practice in disasters;
- Communities - approaches to resilience and engagement;
- Risk, Crisis, and continuity management;
- management of natural and environmental hazards;
- Technology for disaster and emergency management;

- Research design and methods;
- Dissertation.

2.5.10 Emergency Planning and Management, Coventry University

A second MSc course at Coventry University concentrates more on the crisis management aspects of disasters and is aimed primarily at response professionals. In particular, it focusses on providing graduates with “the knowledge skills and competencies necessary to fulfil duties that fall on organisations arising from UK civil contingencies legislation” (Coventry University, 2017b).

Occupational fields

Graduates of the master’s degree programme “Emergency Planning and Management” are prepared for employment within organisations with emergency response duties, including local government, the uniformed services, health and other public sector agencies, as well as private sector companies.

Scope and classification

Full details of the programme were not provided online. However, the information provided about the course suggests that the following topics will be studied:

- Disaster and emergency planning;
- Integrated emergency management, practice and issues;
- Communities - approaches to resilience and engagement;
- Risk, crisis and continuity management;
- Management of natural and environmental hazards;
- Technology for disaster and emergency management;
- Research design and methods;
- Dissertation.

2.5.11 Risk Disaster and Environmental Management, University of Huddersfield

This MSc has more of a business focus than some of the other Master’s courses presented here and provides grounding in topics around natural, man-made and business risks (HUD, 2017). Three themes of study are provided Risk (identify, assessment and management), Disaster (develop ability to analyse the consequences when disasters occur) and Environment (how human activity interacts with the natural environment and how to minimise any damage).

Scope and classification

Full details of the programme were not provided online. However, the information provided about the course suggests that the following topics will be studied:

- Disaster and Emergency Management;
- Forensic Aspects of Disaster Management;
- Principles of Environmental Management;
- Principles of Risk;
- Corporate Responsibility & Governance;
- Research Methods and Techniques;

- Sustainable Business: Environment Management in Practice;
Business Continuity Management.

2.5.12 International Disaster Management, University of Manchester

This MSc provides an international perspective on disaster management in both the developing and developed context. It is “designed for participants who want to increase both theoretical and practical management skills in enhancing resilience to disasters through prevention, preparedness, response and recovery from natural and man-made disaster events” (University of Manchester, 2017). It adopts a very multi-disciplinary perspective drawing modules from history, politics, development studies, the arts and medicine.

Scope and classification

In the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken, including a research dissertation of 30ECTS credits. The programme is composed of core modules taught by the Humanitarian and Conflict Response Institute, whereas students can draw on optional modules from elsewhere including the School of Environment and Development, the School of Social Sciences and the School of Nursing. Full details of the programme were not provided online. However, the information provided about the course suggests that the following topics will be studied:

- Introduction to disaster management;
- Risk management;
- Research & evaluation methods;
- Reconstruction and development;
- Emergency humanitarian assistance;
- Water sanitation planning & policy in the developing world;
- Global health;
- Fundamentals of epidemiology;
- History of humanitarian aid;
- Climate change, poverty and disaster management;

2.5.13 Disaster Resilience and Management, University of Salford

The University of Salford’s, University’s Centre for Disaster Resilience offers an MRes in Disaster Resilience and Management. Few details are provided on the website about the pathways and requirements of MRes candidates, however as a research-oriented programme there will be a heavy focus on independent study. The following categories are identified as potential areas of study:

- capacity building for disaster mitigation and reconstruction;
- project management for post disaster reconstruction;
- disaster risk reduction ;
- risk management and sustainability;
- post-conflict reconstruction;
- stakeholder management and corporate social responsibility;
- community engagement and participation in reconstruction;
- social impact of reconstruction;

- protection and empowerment of women and other vulnerable groups;
- role of women in mitigating and managing disasters;
- livelihood development;
- micro finance and community co-operatives;
- knowledge management and integration;
- impact of culture towards disaster risk reduction;
- post disaster waste management;
- disaster management and theory building;
- extreme weather events and coping strategies;
- business continuity analysis and planning; and
- resilience and adaptive capacities of SMEs.

2.5.14 Disaster Management for Environmental Hazards, University of South Wales

This MSc offered by the University of South Wales provides a range of training from the concepts of environmental hazards and disasters management through to practical responses. There is an emphasis on skills and it offers a two-week summer school, and overseas residential field course and students the opportunity to take extended field or work placements as part of the course. The course aims to enable students to “critically assess the effectiveness of existing disaster risk management techniques, in order to evaluate good practice and apply it to new situations” (University of South Wales, 2017a).

Occupational fields

Graduates of the master’s degree programme “Disaster Management for Environmental Hazards” are prepared for employment in the following fields of activities: governmental organisations, civil protection agencies, non-governmental organisations, industry, insurance companies, specialist consultancies, disaster and emergency planning, flood planning, disaster management and intervention, humanitarian aid and relief work, logistics, community development and capacity building, hazard and risk assessment, environmental monitoring, teaching or further academic research.

Scope and classification

Specific information about credits was not provided online, however it is likely that similar to the other UK Masters it will be 90 ECTS credits equivalent. Similarly, there is no information about the balance of credit between modules, but it appears students are required to take (Table 19):

- Six compulsory core taught modules;
- One optional taught modules;
- Independent Project.

The University of South Wales also offers an online study course MSc in Disaster Healthcare (University of South Wales, 2017b).

Table 19: Relevant courses for the MSc in Disaster Management for Environmental Hazards, University of South Wales

Title	Compulsory/optional
Principles and Concepts in Disasters	Compulsory
Management of Coastal and Hydrological Hazards	Compulsory
Management of Geological and Technological Hazards	Compulsory
Personal Preparedness for Disasters	Compulsory
Disaster Risk Management	Compulsory
Planning for Disasters and Civil Contingencies	Compulsory
Masters Dissertation Project	Compulsory
Applied Geospatial Analysis	Optional
Remote Sensing for Environmental Management	Optional

2.5.15 Crisis and Disaster Management, University of Lincoln

This MSc course focusses firmly on the management element of crises and in particular on preventing the impacts from disasters and has a key business dimension. “This programme brings together the areas of crisis management, risk management and disaster management enabling students to understand current approaches to crisis and disaster and the impact that such events may have on businesses, communities and nations. In particular, the Programme addresses the issues of interruption to business and the need for preparedness, from crises and disasters of both natural and human origins” (University of Lincoln, 2017).

Occupational fields

Graduates of the master’s degree programme “Crisis and Disaster Management” are prepared for employment in the following fields of activities: emergency planning, disaster response, and crisis communication. It provides for critical examination of contingency and business continuity plans and approaches crises and disaster recovery as 'windows of opportunity'.

Scope and classification

In the scope of this master’s degree programme courses in the extent of 90 ECTS Credits (180 UK credits) have to be taken (Table 20). The courses are subdivided into the following classification:

- Seven compulsory core taught modules: 52.5 ECTS equivalent;
- One optional taught modules: 7.5 ECTS equivalent;
- Independent study: 30 ECTS equivalent (from a choice of three different types).

Table 20: Relevant courses for the MSc in Crisis and Disaster Management, University of Lincoln

Title	Compulsory/optional	ECTS credits
Disaster management	Compulsory core	7.5
Crisis communication	Compulsory core	7.5
Humanitarian logistics	Compulsory core	7.5
Project planning and management	Compulsory core	7.5
Decision analysis for managers	Compulsory core	7.5
Finance and accounting	Compulsory core	7.5
Teams and leadership	Compulsory core	7.5
Research dissertation	Optional independent study	30
Consultancy project	Optional independent study	30
Start-up venture	Optional independent study	30
Global supply strategies	Optional	7.5
Social entrepreneurship	Optional	7.5
Trade and development	Optional	7.5
Analysing fiction	Optional	7.5

2.5.16 Risk, Crisis and Disaster Management, University of Leicester

The University of Leicester offers a two year distance learning course in Risk, Crisis and Disaster Management. The course focusses on both the theory of risk management and how to apply it in practice (LE, 2017).

Scope and classification

Specific information about credits was not provided online, however it is likely that similar to the other UK Masters it will be 90 ECTS credits equivalent. Similarly, there is no information about the balance of credit between modules, but it appears students are required to take six modules and a dissertation in order to complete the Master's degree (Table 21).

Table 21: Relevant courses for the MSc in Risk, Crisis and Disaster Management, University of Leicester

Title	Compulsory/optional
Theories of Risk and Crisis	Compulsory
Managing Risk and Crisis	Compulsory
Research Methods	Compulsory
Case Studies of Crises and Disasters	Compulsory
Models of Risk, Crisis and Disaster	Compulsory
Emergency Planning Management	Compulsory
Research Dissertation	Compulsory

2.6 Master curricula in additional EU countries

2.6.1 Overview

A few master curricula dealing with natural disasters and risk management are available in different EU countries, which are not members of this project consortium. The collection of additional master programmes increases the data set for developing new master curricula in Western Balkan countries. An overview of existing master curricula in additional EU countries is given in Table 22.

Table 22: Relevant master's programmes in EU countries, which are not members of this project consortium

Master's programme	Academic degree	University	Country
Master of Disaster Management	MSc	University of Copenhagen	Denmark
Disaster Risk Management and Climate Change Adaption	MSc	Lund University	Sweden
Geo-information Science and Earth Observation	MSc	University of Twente	The Netherlands
Master of Science in Geography of Environmental Risks and Human Security	MSc	University of Bonn	Germany
Natural Hazards and Risks in Structural Engineering	MSc	Bauhaus-University Weimar	Germany

2.6.2 Master of Disaster Management, University of Copenhagen

The aim of the Master of Disaster Management, which is offered by the University of Copenhagen, is to provide government, international, and civil society organisations with professionals equipped with a solid interdisciplinary knowledge base and skills that can meet the increasing demands and expectations from those who work in the humanitarian field.

The Master of Disaster Management is relevant to a lot of professions and is designed to accommodate various disciplinary backgrounds - risk managers, engineers, doctors, nurses, military officers, social scientists, logisticians, journalists, etc. This means a broad array of people working in national authorities, international organisations (e.g. UN, Red Cross/Red Crescent Movement, EU), public services (civil protection, health, energy, water) and humanitarian organisations (e.g. MSF, Oxfam, DEMA) (University of Copenhagen, 2017).

Further information related to the programme can be found on <http://www.mdma.ku.dk/>.

Programme structure

The Master of Disaster Management consists of 60 ECTS earned through four intensive core courses, two elective courses and a thesis (Table 23).

The programme starts in September and ends in July the following year.

Table 23: Relevant courses for the MSc in Disaster Management, University of Copenhagen

Title	Core courses/Electives	ECTS credits
Disaster Risk Management - From Theory to Practice	Core course	7.5
Preparedness and Response to Humanitarian Crises	Core course	7.5
Disaster Recovery Planning and Development	Core course	7.5
Research Methodology and Ethics	Core course	7.5
Vulnerability and Risk Assessment Methods	Electives	5
Health in Emergencies and Refugee Health	Electives	5
Water Supply and Sanitation in Emergencies	Electives	5
Geo-information in Disaster Situations	Electives	5
Shelter and Settlements in Disasters	Electives	5
Thesis		20

2.6.3 Disaster Risk Management and Climate Change Adaption, Lund University

The trend of increasing disasters and related losses is a truly global challenge. The changing global risk landscape due to processes such as climate change, urbanisation, and the increasing complexity of modern society poses major challenges for sustainable development and must be addressed. A growing number of governments and international organisations acknowledge the necessity of increasing their efforts in disaster risk management and climate change adaptation in order to develop safe and sustainable societies (Lund University, 2017).

The Master's programme in Disaster Risk Management and Climate Change Adaptation, which is offered by the Lund University, has support from important national and international institutions, e.g. UN agencies, the Red Cross/Red Crescent movement, NGOs, and national authorities (Lund University, 2017).

The programme contributes to meeting the need for qualified professionals who can (Lund University, 2017):

- contribute to resilient and sustainable societies through use of concepts, methods and tools within disaster risk management and climate change adaptation such as risk assessment, capacity assessment, preparedness and contingency planning, and urban/rural planning;
- work with capacity development and project management for disaster risk management and climate change adaptation in local, national and international settings;
- utilise and contribute to research in this field.

The programme offers a mix of practical and theoretical learning with a strong focus on interaction between students and teaching staff, as well as with important factors within this field of study. Examples of the latter are involvement of experts from national and international organisations in some of the courses and the possibility of taking an elective internship-based course (Lund University, 2017).

Programme courses

An overview about the relevant courses for the MSc in Disaster Risk Management and Climate Change Adaption is given in Table 24 (Lund University, 2017).

Table 24: Relevant courses for the MSc in Disaster Risk Management and Climate Change Adaption, Lund University

Title	Compulsory courses/Electives	ECTS credits
Societal Resilience	Compulsory course	7.5
Foundations for Risk Assessment and Management	Compulsory course	7.5
Capacity Development	Compulsory course	7.5
Direction and Coordination in Disaster Management	Compulsory course	7.5
Governance of Sustainability	Compulsory course	7.5
Preparedness and Planning	Compulsory course	7.5
Urban and Rural Systems and Sustainability	Compulsory course	10
Research Methodology	Compulsory course	5
Master's degree project	Compulsory course	30
Geographical Information Technology - Introduction	Electives	15
Geographical Information Technology - Advanced	Electives	15
Fundamentals of Logistics and Operations Management	Electives	7.5
Humanitarian Logistics	Electives	7.5
Internship-based course	Electives	15
Integrated Water Resources Management: International Aspects	Electives	7.5
Additional courses	Electives	

Career prospects

Students graduating from the Master's programme in Disaster Risk Management and Climate Change Adaptation will be attractive for a career with actors contributing to a more resilient and sustainable society, ranging from local and national authorities to international actors as well as private consultancies. The programme provides qualifications for both professional activities in society and for research studies at PhD level (Lund University, 2017).

The network of organisations supporting the programme have in their letters of support for the programme emphasised the need for professionals with qualifications in e.g. risk assessment, preparedness/contingency planning and capacity development, topics which are at the core of the programme (Lund University, 2017).

Further information related to the programme can be found on <http://www.lunduniversity.lu.se/lubas/i-uoh-lu-TAKAK>.

2.6.4 Geo-information Science and Earth Observation, University of Twente

The 18-month master's in Geo-Information Science and Earth Observation is an internationally oriented programme offered by the University of Twente and leads to a Master of Science (MSc). Within this master programme seven different specializations are offered including also Natural Hazards and Disaster Risk Management. The following information is only related to the mentioned specialization (University of Twente, 2017).

The master's course with specialization in Natural Hazards, Risk and Engineering leading to an MSc degree is for students who want to become experts in using remote sensing and GIS technology for natural hazard and disaster risk assessment, spatial analysis and predictive modelling, and geotechnical engineering. As a student in this course you are at ease with quantitative analysis methods and already have some knowledge of dynamic processes at the earth surface. The students often have a background in earth science, geography, engineering, or environmental science (University of Twente, 2017).

Master course content

The master's programme in Geo-information Science and Earth Observation is divided into four blocks. The blocks vary in length and are divided into three week modules. The number of modules for the programme is 23 (University of Twente, 2017).

- Block 1 (modules 1-3): Concepts of remote sensing and GIS technology.
- Block 2 (modules 4-10): Application of RS and GIS for natural hazards, risk and engineering.
- Block 3 (modules 11-15): Advanced courses and MSc research preparation
- Block 4 (modules 16-23): Individual research MSc research phase

Achievements

Throughout the master's course emphasis is put on the meaningful and creative use of concepts, techniques and tools from an earth science perspective, but with an open eye to other disciplines and scientific fields. At the end of the master's course you are able to (University of Twente, 2017):

- analyse problems encountered in professional practice and develop appropriate methods for studying a/o solving these problems;
- use geo-information science and earth observation to generate, integrate, analyse and display spatial data;
- evaluate and apply relevant methods and models for data analysis and problem solving;
- formulate and carry out an MSc research project and defend the results of this thesis work;
- contribute with knowledge and skills to problem solving in natural hazards, risk and engineering context;
- work in teams with specialists of other disciplines;
- display critical learning attitude, be flexible, pro-active, have a vision;
- respond to changing demands and opportunities from both the scientific discipline and society;

- effectively communicate the results of investigations, both to scientific peers and the general public.

Career opportunities

An MSc degree in Geo-information Science and Earth Observation for Natural Hazards, Risk and Engineering provides a good basis for international employment. Our graduates have found positions in research institutes and universities, in national and international agencies dealing with disaster risk mitigation and civil protection, and in the private sector (engineering, consultancy, insurance). For excellent students with research ambition this master' course is a good starting point for PhD research with an academic research group in Europe or worldwide (University of Twente, 2017).

Further information related to the programme can be found on <https://www.utwente.nl/en/education/master/programmes/geo-information-science-earth-observation/specialization/applied-earth-sciences-natural-hazards-risk-engineering/>.

2.6.5 Master of Science in Geography of Environmental Risks and Human Security, University of Bonn

The joint international MSc programme aims to build on the success and potential of existing research programmes on vulnerability and disaster risk at UNU-EHS and related research activities at the Department of Geography of the University of Bonn. The main purpose of the MSc programme is to provide postgraduate students detailed knowledge and critical understanding as well as an interdisciplinary approach towards environmental risks with a focus on developing countries to enable them to investigate and manage all kinds of natural disasters by implementing science-based principles and strategies for all theoretical and practical activities related to disaster risk management. The programme has a strong focus on developing countries in line with the mandate and research profile of UNU-EHS and the development research in geography conducted by the University of Bonn. In addition, the students have the opportunity to engage in on-going research projects at both institutions. Based on the various research projects and the extensive network partners in developing countries, the programme is able to incorporate current development issues and real world problems faced by communities in countries exposed to natural hazards. In addition, the link to UN agencies and other international organizations through external lecturers and internship placements ensures that the program is focused on actual problems (University of Bonn, 2017).

Job opportunities

UN agencies, international organisations, institutions of international cooperation (University of Bonn, 2017)

Master course content

The Programme consists of 11 modules (Table 25) of which nine are taught in the first three semesters, followed by a compulsory internship and the independent work on the Master-Thesis. An internship of at least eight weeks is a compulsory part of the programme (University of Bonn, 2017).

Table 25: Relevant modules for the MSc in Master of Science in Geography of Environmental Risks and Human Security, University of Bonn

Title	Modules	ECTS credits
Theories and Concepts of Risk	Module 1	6
General Approaches to Risk and Human Security	Module 2	12
Research Methods I	Module 3	6
Academic and Intercultural Skills	Module 4	6
Advanced Debates on Risk and Human Security	Module 5	12
Research Project / Practical Training	Module 6	6
Research Methods II	Module 7	6
Fieldtrips	Module 8	6
Applied Topics on Risk and Human Security	Module 9	12
Internship	Module 10	12
Master Thesis	Module 11	30

Further information related to the programme can be found on https://www.uni-bonn.de/studying/international-students/international-degree-programs/natural-sciences-and-mathematics/copy_of_master2019s-program-in-computer-science.

2.6.6 Natural Hazards and Risks in Structural Engineering (NHRE), Bauhaus-University Weimar

The Natural Hazards and Risks in Structural Engineering (NHRE) master's degree programme, which is offered by the Bauhaus-University Weimar, has a strong international orientation. It trains students to apply themselves to demanding engineering tasks with regard to specific external influences, such as earthquakes. We teach students how to use modern equipment to assess the dangers and damage potential of natural phenomena, we show them how to create models and simulations, and we prepare them for conducting projects and- risk analyses of their own.

In this way, the programme provides students with key qualifications for engineering positions which require innovative, enterprising solutions for dealing with a wide variety of natural dangers, like earthquakes, floods and storms (Bauhaus-University Weimar, 2017).

Master course content

The master's degree programme is subdivided into different courses (compulsory, elective compulsory and elective) and has an overall effort of 120ECTS credits (Table 26).

Table 26: Relevant courses for the MSc in Natural Hazards and Risks in Structural Engineering, Bauhaus-University Weimar

Title	Compulsory courses/Electives	ECTS credits
Stochastics and risk assessment	Compulsory course	6
Structural dynamics	Compulsory course	6
Structural engineering	Compulsory course	6
Primary hazards and risks	Compulsory course	6
Geographical Information Systems (GIS) and building stock survey	Compulsory course	6
Earthquake engineering and structural design	Compulsory course	6
Hazard projects and advanced geotechnologies	Compulsory course	6
Geo- and hydrotechnical engineering	Compulsory course	6
Disaster Management and Mitigation Strategies	Compulsory course	6
Experimental structural evaluation and rehabilitation	Electives	6
Life-lines engineering	Electives	6
Elective compulsory modules	Electives compulsory course	18
Elective modules	Electives	12
Master thesis		24

Further information related to the programme can be found on <https://www.uni-weimar.de/en/civil-engineering/studies/master-degree-programmes/natural-hazards-and-risks-in-structural-engineering-master-of-science/>.

3 Literature

- Bauhaus-University Weimar (2017). Master's degree programme on Natural Hazards and Risks in Structural Engineering. <https://www.uni-weimar.de/en/civil-engineering/studies/master-degree-programmes/natural-hazards-and-risks-in-structural-engineering-master-of-science/>. Accessed in Mar 2017.
- BOKU – University of Natural Resources and Life Sciences, Vienna (2015). Curriculum für das Masterstudium Alpine Naturgefahren/Wildbach- und Lawinenverbauung, Kennzahl 066477, Vienna.
- BOKU – University of Natural Resources and Life Sciences, Vienna (2016). Curriculum für das Masterstudium Kulturtechnik und Wasserwirtschaft, Kennzahl 066431, Vienna.
- Coventry University (2017a). Disaster Management MSc. <http://www.coventry.ac.uk/course-structure/engineering-environment-and-computing/postgraduate/disaster-management-msc/>. Accessed in Feb 2017.
- Coventry University (2017b). Emergency Planning and Management MSc. <http://www.coventry.ac.uk/course-structure/engineering-environment-and-computing/postgraduate/emergency-planning-and-management-msc/>. Accessed in Feb 2017.
- DUR – Durham University (2017a). MA in Risk. <https://www.dur.ac.uk/geography/postgraduate/riskmasters/ma-in-risk/>. Accessed in Feb 2017
- DUR – Durham University (2017b). MSc in Risk. <https://www.dur.ac.uk/geography/postgraduate/riskmasters/msc-in-risk/>. Accessed in Feb 2017

- HUD – University of Huddersfield (2017). Risk Disaster and Environmental Management MSc 2017-18. <https://www.hud.ac.uk/courses/full-time/postgraduate/risk-disaster-and-environmental-management-msc/>. Accessed in Feb 2017.
- KCL – King’s College London (2017). Disasters, Adaption & Development MA/MSc. <http://www.kcl.ac.uk/study/postgraduate/taught-courses/disasters-adaptation-and-development-ma-msc.aspx>. Accessed in Feb 2017.
- LE – University of Leicester (2017). Risk, Crisis and Disaster Management. <https://le.ac.uk/courses/risk-crisis-and-disaster-management-msc-dl>. Accessed in Feb 2017.
- Lund University (2017). Disaster Risk Management and Climate Change Adaptation - Master's Programme. <http://www.lunduniversity.lu.se/lubas/i-uoh-lu-TAKAK>. Accessed in Mar 2017
- Marche Polytechnic University (2017). Master Degree in Environmental Risk and Civil Protection http://www.univpm.it/Entra/Offerta_formativa_2/Master_Degree_in_Environmental_Risk_and_Civil_Protection/L/0 Accessed in Apr 2017.
- Northumbria University (2017). Disaster Management and Sustainable Development. <https://www.northumbria.ac.uk/study-at-northumbria/courses/disaster-management-and-sustainable-development-msc-ft-dtfdsd6/#brief%20%20Student%20run%20society>. Accessed in Feb 2017
- Polytechnic of Milano (2017). MSc in Civil Engineering for Risk Mitigation. <http://www.port.ac.uk/courses/geography-earth-and-environmental-sciences/msc-crisis-and-disaster-management/>. Accessed in Jan 2017.
- PORT – University of Portsmouth (2017). MSc Crisis and disaster management. http://www.polinternational.polimi.it/uploads/media/Civil_Engineering_Risk_Mitigation.pdf. Accessed in Apr 2017.
- TU Graz – Graz University of Technology (2015). Curriculum for the master’s degree programme in Geotechnical and Hydraulic Engineering, Graz.
- TU Wien – Vienna University of Technology (2013). Studienplan für das Masterstudium Bauingenieurswesen, Vienna.
- UCL – University College London (2017). IRDR Taught Programmes. <http://www.ucl.ac.uk/rdr/teaching/graduate>. Accessed in Feb 2017.
- UK Government (2016). Winter 2015 to 2016 floods: government response. <https://www.gov.uk/government/news/north-west-england-floods-2015-government-response>. Accessed in Jan 2017.
- University of Bonn (2017). Master of Science in Geography of Environmental Risks and Human Security. https://www.uni-bonn.de/studying/international-students/international-degree-programs/natural-sciences-and-mathematics/copy_of_master2019s-program-in-computer-science Accessed in Mar 2017.
- University of Camerino (2017). Master Degree Geoenvironmental Resources and Risks. https://international.unicam.it/sites/d7.unicam.it.international/files/geologia_mag_EN.pdf Accessed in Apr 2017.
- University of Copenhagen (2017). Master of Disaster Management. <http://www.mdma.ku.dk/>. Accessed in Mar 2017.
- University of Genoa (2017). MSc in Civil and Environmental Engineering. <http://civamb.dicca.unige.it/eng/clm/index.html>. Accessed in Apr 2017.

- University of Lincoln (2017). Crisis and Disaster Management. http://www.lincoln.ac.uk/about/courses/cridisms_2017-18.pdf. Accessed in Feb 2017.
- University of Manchester (2017). MSc International Disaster Management. <http://www.manchester.ac.uk/study/masters/courses/list/09910/msc-international-disaster-management/all-content/>. Accessed in Feb 2017.
- University of Messina (2017). [9229/2015] - TUTELA E GESTIONE DEL TERRITORIO E DELL'AMBIENTE NATURALE. http://www.unime.it/it/didattica/offerta_didattica/_offerta/2016/10302/2015. Accessed in Apr 2017.
- University of Rome "La Sapienza" (2017). MSc in Engineering Geology, Land Use Management and Georisks. https://corsidilaurea.uniroma1.it/sites/default/files/allegati_il_corso/pieghevole_geol._a_ppl.2016-17.pdf. Accessed in Apr 2017.
- University of South Wales (2017a). MSc Disaster Management for Environmental Hazards. <http://www.southwales.ac.uk/courses/msc-disaster-management-for-environmental-hazards/>. Accessed in Feb 2017.
- University of South Wales (2017b). MSc Disaster Healthcare (Online Delivery). <http://www.southwales.ac.uk/courses/msc-disaster-healthcare-online-delivery/>. Accessed in Feb 2017.
- University of Twente (2017). Master's degree (MSc) programme Geo-information Science and Earth Observation –Applied Earth Sciences with specialization in Natural Hazards, Risk and Engineering. <https://www.utwente.nl/en/education/master/programmes/geo-information-science-earth-observation/specialization/applied-earth-sciences-natural-hazards-risk-engineering/>. Accessed in Mar 2017.