

## Catalogue of competencies

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## List of abbreviations

EHEA	European Higher Education Area
EQF	European Qualification Framework
HE	Higher Education
HEI	Higher Education Institution
NatRisk	Development of master curricula for natural disasters risk management in Western Balkan countries
NDRM	Natural disasters risk management
WB	Western Balkan

# 1 Overview of existing master curricula

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 (NDRM) have been established. Other member states in turn have included appropriate courses in existing master curricula. An overview of existing master’s degree programmes related to NDRM in Europe and Western Balkan countries involved in NatRisk project are outlined.

## 1.1 Europe

Information about existing master curricula in EU countries is indispensable for developing master curricula for risk management in Western Balkan regions. An overview about high-level education programmes all over Europe is shown in Table , while more information is available in the report on “Master curricula best practices in EU partner countries” of WP1.3. Blue coloured rows indicate EU project partners and green coloured rows characterize additional EU countries. Overall 36 different master degree programmes dealing with natural disaster risk management were found.

Table 1. Overview of existing master curricula in Europe

Nation	Number of master’s degree programmes	Universities
Austria	4	<ul style="list-style-type: none"> <li>University of Natural Resources and Life Sciences Vienna, BOKU (2)</li> <li>Graz University of Technology, TU Graz</li> <li>Vienna University of Technology, TU Wien</li> </ul>
Greece	1	<ul style="list-style-type: none"> <li>Technological Educational Institute of Eastern Macedonia and Thrace and Fire Brigade Academy</li> </ul>
Italy	11	<ul style="list-style-type: none"> <li>University of Messina</li> <li>University of Camerino</li> <li>Polytechnic of Milan</li> <li>Marche Polytechnic University</li> <li>University of Genoa</li> <li>University of Basilicata</li> <li>University of Rome “La Sapienza”</li> <li>School of Advanced Studies IUSS Pavia, University of Patras, University of Grenoble Alpes, Middle East Technical University</li> <li>University of Cagliari, Interuniversity Consortium for Hydrology (CINID), Autonomous Region of Sardinia</li> <li>University of Thessaly, Hellenic Open University, Università degli Studi di Messina, Universitat de Barcelona</li> <li>University of Salerno</li> </ul>
United Kingdom	15	<ul style="list-style-type: none"> <li>Kings College London</li> <li>University College London (3)</li> <li>Northumbria University</li> <li>Durham University</li> <li>University of Portsmouth</li> <li>Coventry University (2)</li> <li>University of Huddersfield</li> <li>University of Manchester</li> <li>University of Salford</li> </ul>

		<ul style="list-style-type: none"> <li>• University of South Wales</li> <li>• University of Lincoln</li> <li>• University of Leicester</li> </ul>
Denmark	1	<ul style="list-style-type: none"> <li>• University of Copenhagen</li> </ul>
Germany	2	<ul style="list-style-type: none"> <li>• University of Bonn</li> <li>• Bauhaus-University Weimar</li> </ul>
Sweden	1	<ul style="list-style-type: none"> <li>• Lund University</li> </ul>
The Netherlands	1	<ul style="list-style-type: none"> <li>• University of Twente</li> </ul>
<b>Total:</b>	<b>36</b>	

## 1.2 Western Balkan countries involved in NatRisk project

An overview of existing curricula in the field of NDRM in Serbia, Kosovo\* and Bosnia and Herzegovina (Table 2) indicates deficiency of study programmes in this field. That implies lack of professionals with adequate competencies required for effective performance within the context of natural disaster risks. The conclusion is that WB HEIs need to develop knowledge bases concerning prevention, preparedness, response, recovery and resiliency activities.

Table 2. Overview of existing master curricula in Western Balkan countries involved in NatRisk project

Nation	Number of master's/bachelor's degree programmes	Universities
Serbia	2/1	<ul style="list-style-type: none"> <li>• University of Nis, Faculty of occupational safety (<a href="http://www.znrfak.ni.ac.rs/SERBIAN/ENG-10-02-01-MAS-EM.html">http://www.znrfak.ni.ac.rs/SERBIAN/ENG-10-02-01-MAS-EM.html</a>)</li> <li>• University of Novi Sad, Faculty of technical sciences (<a href="http://www.ftn.uns.ac.rs/1504671034/disaster-risk-management-and-fire-safety">http://www.ftn.uns.ac.rs/1504671034/disaster-risk-management-and-fire-safety</a>; <a href="http://www.ftn.uns.ac.rs/530431994/disaster-risk-management-and-fire-safety">http://www.ftn.uns.ac.rs/530431994/disaster-risk-management-and-fire-safety</a>)</li> </ul>
Bosnia and Herzegovina	0/1	<ul style="list-style-type: none"> <li>• Nezavisni univerzitet Banja Luka, Fakultet za bezbjednost i zaštitu (<a href="http://fbzbl.net/site/studijski-programi/">http://fbzbl.net/site/studijski-programi/</a>)</li> </ul>
Kosovo*	0	

Master study programme Emergency Management at the University of Nis, Faculty of occupational safety: The purpose of this master academic study programme is to educate students to become master engineers in environmental protection – emergency management enabled to apply scientific and professional achievements in solving the problems of safety of humans, natural and material wealth, and in developing emergency management systems.

Master study programme Disaster Risk Management and Fire Safety at the University of Novi Sad, Faculty of technical sciences: It is a highly multidisciplinary and interdisciplinary programme in accordance with the needs of society in emergency situations and provides students with competencies and qualifications that are socially justified and useful.

## 2 Catalogue of competencies

Requirements for employees dealing with natural disaster risk management are wide-ranging and demanding. They should have knowledge and understanding of science behind the natural risks empowered with applied and practical skills.

### 2.1 Definition of competences

Within the European Union, “competences are defined as a combination of knowledge, skills and attitudes appropriate to the context”. (European Parliament, 2006).

*“A competence is more than just knowledge or skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context.”*

Source: EDU Working paper no. 41, 2009

The European Commission’s Cedefop glossary defines a skill as follows:

*“the ability to perform tasks and solve problems, while a competence is the ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development).*

*A competence is not limited to cognitive elements (involving the use of theory, concepts or tacit knowledge); it also encompasses functional aspects (involving technical skills) as well as interpersonal attributes (e.g. social or organizational skills) and ethical values. A competence is therefore a broader concept that may actually comprise skills (as well as attitudes, knowledge, etc.)”*

Source: Cedefop, 2008

In the context of NatRisk project the following explanation of the term competence will be used:

Combination of knowledge, skills and attitudes and ability to their effective applying within the context of a work's responsibilities.

The **Bologna Process** by developing quality systems in higher education (HE) also comprises research and systematic establishment of competences’ monitoring and evaluation. It is one of established educational standards of the European Higher Education Area (EHEA) to enable students to acquire competences. The education levels related to knowledge, skills and competences have been established by **Framework for Qualification of the EHEA** and **European Qualification Framework (EQF)**.

Master curricula of NatRisk project will be compatible with the Framework for Qualification of the EHEA for the second cycle.

„Qualifications that signify completion of the second cycle (e.g. Master's degrees) are awarded to students who:

- *have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;*
- *can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;*
- *have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;*
- *can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;*
- *have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.”*

Source: Bologna Working Group, 2005

The descriptor for the second cycle corresponds to the learning outcomes for European Qualification Framework (EQF) level 7 (Table 3).

Table 3. Descriptors defining the seventh level in the EQF

EQF Level	Knowledge	Skills	Competence
Level 7	<p><i>Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research</i></p> <p><i>Critical awareness of knowledge issues in a field and at the interface between different fields</i></p>	<p><i>Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields</i></p>	<p><i>Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams</i></p>

## 2.2 Competence-based master study programs in natural disasters risk management

Competence-based curriculum is focused on core learning areas i.e. learning expectations in terms of knowledge, focusing on outcomes instead of inputs and making reference to general or transversal competences that will be developed across the whole curriculum.

Creation of competence-based master study programs in natural disasters risk management (NDRM) will perceive following requirements:

- specificity of topic in natural disasters risk management,
- European Higher Education Area requirements,
- Western Balkan (WB) Higher Education Institutions (HEIs) conditions,
- social needs,
- students needs for better employment, and
- national legislation, strategies and action plans.

Dealing with complex topic of natural disasters, future master curricula should compound knowledge about natural phenomena, specific modern and innovative technologies and multiple social needs. New master curricula should provide knowledge and deeper understanding of science behind the natural risks along with empowering the applied and practical skills.

Theoretical part should critically follow the very rapid pace of innovation in natural disasters risk management related scientific and technical domains. Holistic knowledge about typical natural disasters (e.g.: types, development, recurrence intervals, etc.) is necessary to be able to analyse the causes of natural disasters and to understand complex interconnections. In addition, graduates with civil engineering background should have a technical understanding of structural measures (e.g.: planning, prevention, designing, construction, damage assessment, etc.) that are significant part for development of protection system from natural disasters.

Graduates should be aware that measures for dealing with natural disasters are part of wider scope and have to consider that in planning processes. Their actions must be incorporated into neighbourhood and regional plans and be part of sustainable and environmental-friendly solutions.

Various challenges of natural disaster situations require complex and comprehensive skills needed for the future professionals to cope with stressful environments. Skills for an integral management of natural disasters (“manager”), a technical know-how for necessary construction measures (“technician”) as well as knowledge about institutional framework for action in natural disasters situations (“lawyer”) are elements in the catalogue of competencies for well-developed employees. Furthermore, soft skills including appropriate modes of behaviour during communications and presentations as well as experiences in project management are indispensable. The integral approach of multidisciplinary skills is shown in Figure 1.

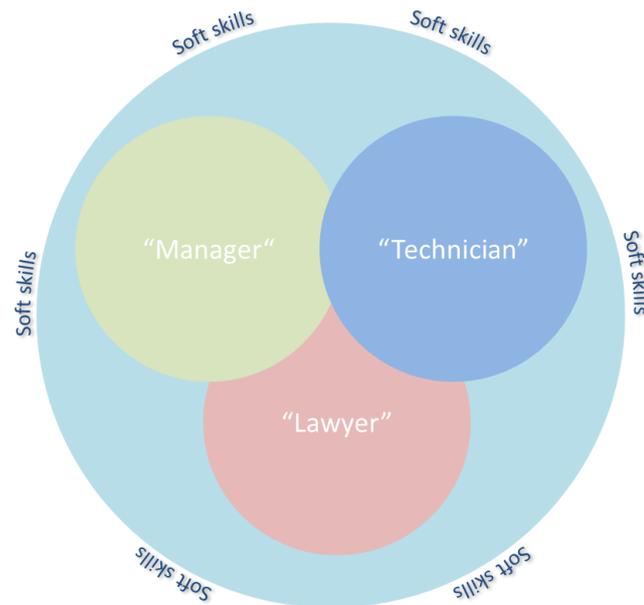


Figure 1. Integral approach of multidisciplinary skills of graduates

Graduates of a master degree programme will acquire the competencies that have to be in accordance with policy and operational frameworks. Due to the fact that different stakeholders (e.g.: companies, citizens, authorities, NGO's, etc.) are affected by natural disasters, graduates should have the capabilities for managing multidisciplinary holistic approaches and the areas of their activities and responsibilities are widely spread. Due to the fact that responsible decision-makers (e.g.: minister, mayor, etc.) are usually no experts in the field of natural disasters, graduates of the new master curricula should have the competencies to prepare information for them. They have to be capable for developing and executing mid-term or long-term strategies necessary for coping with natural disasters within relevant policy frameworks. Populist measures with short-term effects should be avoided to prevent people from future negative impacts.

Due to the fact that natural disasters can have huge impacts on different sectors, which are subject to various laws, the management of natural disasters requires knowledge about valid national legislation i.e. institutional framework for action in natural disasters situations. Knowledge about institutes and authorities responsible for developing and executing international, federal, provincial and/or municipal laws and contacts to relevant persons are crucial. Additionally, awareness about EU legislation (e.g.: EU Floods Directive, EU Water Framework Directive, bilateral or multilateral agreements etc.) is necessary to meet the international legal requirements.

Development of such complex master curricula covering civil protection, emergency management, disaster risk reduction, risk mitigation and prevention, requires holistic and multidisciplinary approaches and on that way will fulfill HEIs commitment to society in the sense of contribution to resilient and sustainable society.

It must be taken into account different profile of WB HEIs. The HEIs scientific area will define levels of NDRM competences regarding awareness, expertise, knowledge base, applications,

technical competences, critical understanding, thinking and research, skills and tools. Students with lower mathematical and physics' competences will acquire more standard tasks, while civil engineers will have to adopt more complex problems and solutions of risk prevention and management.

New master curricula will be integrated in national efforts for regulation and improvement in the field of NDRM through the national legislative, strategic and institutional framework which are in the process of harmonizing with EU strategies and legislations within the WB countries accession. They will be also in accordance with an agenda for modernization of Europe's higher education systems that states *"modernization of Europe's higher education depends on the competence."*

Development of Catalogue of competencies is also based on the conclusions resulting from the documents delivered during the NatRisk project implementation such as **Report on natural disasters in the Western Balkans**, **Report on established practices in EU countries for natural disaster risk management (NDRM)**, and **Survey of citizens' and public sector awareness**.

Aims, course contents and learning activities of new master curricula will be realized in line with previous defined competencies and rules and regulations on accreditation standards and procedures.

After graduating the new master curricula, managers will acquire certain competencies to perform their duties, functions and responsibilities in effective, efficient and proactive way.

### 3 NatRisk catalogue of competencies

Natural disasters risk management is field that requires multiple competencies related to **knowledge** which covers complex nature of NDRM from interdisciplinary perspectives and **practical skills** for implementation of new organisational strategies and use of the most advanced solutions to contemporary problems. Therefore, multiple competencies can be summarized in two categories:

- generic (key, cross-curricular, core or transferable competencies across study areas) and
- subject-specific competencies (i.e. competencies specific to a subject area).

#### 3.1 Generic competencies

*„Key competences are those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment.“*

Source: European Parliament, 2006

Generic competencies are needed for the application of academic knowledge, cognitive abilities and technical skills to situations in the field. The students will develop ability for

- communication,
- critical thinking,
- scenario modeling,
- creativity,
- initiative,
- prediction of solutions and consequences,
- collaboration,
- working in multidisciplinary team,
- intensive use of ICT in acquiring knowledge and solving problems,
- solving complex multidisciplinary problems in theory and practice applying acquired knowledge,
- social and civic responsibility,
- development of professional ethics and responsibility,
- effective leadership,
- strategic thinking,
- identification and analysis of problems in NDRM,
- experience-based critical decision making,
- staying up-to-date with technological development,
- holistic and proactive approach to NDRM situations,
- clearly and unambiguously transfer knowledge to the professional and wider public.

### 3.2 Subject-specific competencies

The cross-curricular themes of NatRisk master programs will deal with the environmental and sustainability issues in combination with other domains. Master programs will be grounded on fundamental and advanced tools management to tackle a variety of natural disasters. The technical and scientific parts will contain comprehensive tools in risk prevention and mitigation. Multi- and inter-disciplinarity will be achieved through the solving of real life risk management problems.

Students will be faced with a complex and interrelated nature of master curricula subjects. After graduating they acquired detailed knowledge in NDRM and the ability for solving specific problems using the scientific methods and procedures as well as for anticipation and application of novelties in practice. They will be on the one hand responsible for preventing and mitigating damages, on the other they will work as consultants for public administrations and companies.

Completion of the master NatRisk curricula provides students with the following subject competencies:

- understanding of climate changes and natural disasters,
- awareness of the complex and overlapping nature of disaster,

- mastering of methods, procedures and processes of risk identification,
- understanding the causes and consequences of disasters,
- devising strategies and developing methodology and methods of emergency as part of NDRM,
- optimizing and managing available resources in emergency as part of NDRM systems,
- statistical data processing in order to define and make adequate conclusions,
- integrated management in natural disaster situations,
- understanding of civil protection mechanism and institutional framework in NDRM,
- knowledge of the processes associated with risk assessments, land-use planning, structural mitigation,
- natural disasters analysis and risk assessment,
- knowledge about prevention, mitigation, response and recovery operations,
- applying ICT in NDRM,
- development of human resources in NDRM,
- applying specialized civil engineering fields in NDRM,
- protection of critical infrastructure in natural disaster situations,
- understanding and using appropriate methods for research design regarding data collection and analysis, particularly focused on contemporary qualitative and quantitative methods,
- cognizant of the needs of special populations,
- evaluation of the potential for more and worse disasters, and appreciate the need for a more proactive approach to disaster management.

### 3.3 Translating competencies into subjects

Course contents of NDRM master curricula will be realized in line with previous defined specific competencies that determine the actual content of each subject. The WB HEIs will define subjects (mandatory and elective) regarding their scientific area, expertise, knowledge base, technical competences, skills and tools. Table 4 shows link between competencies and subjects.

Table 4. Link between competencies and subjects

		MANDATORY SUBJECTS			ELECTIVE SUBJECTS		
		MS1	MS2	...	ES1	ES2	...
<b>Generic competencies</b>	communication						
	critical thinking						
	scenario modeling						
	creativity						
	initiative						
	prediction of solutions and consequences						
	collaboration						
	working in multidisciplinary team						
	intensive use of ICT in acquiring knowledge and solving problems						
	solving complex multidisciplinary problems in theory and practice applying acquired knowledge						

	social and civic responsibility								
	development of professional ethics and responsibility								
	effective leadership								
	strategic thinking								
	identification and analysis of problems in NDRM								
	experience-based critical decision making								
	staying up-to-date with technological development								
	holistic and proactive approach to NDRM situations								
	clearly and unambiguously transfer knowledge to the professional and wider public								
	<b>Subject-specific competencies</b>	understanding of climate changes and natural disasters							
		awareness of the complex and overlapping nature of disaster							
mastering of methods, procedures and processes of risk identification									
understanding the causes and consequences of disasters									
devising strategies and developing methodology and methods of emergency as part of NDRM									
optimizing and managing available resources in emergency as part of NDRM systems									
statistical data processing in order to define and make adequate conclusions									
integrated management in natural disaster situations									
understanding of civil protection mechanism and institutional framework in NDRM									
knowledge of the processes associated with risk assessments, land-use planning, structural mitigation									
natural disasters analysis and risk assessment									
knowledge about prevention, mitigation, response and recovery operations									
applying ICT in NDRM									
development of human resources in NDRM									
applying specialized civil engineering fields in NDRM									
protection of critical infrastructure in natural disaster situations									
understanding and using appropriate methods for research design regarding data collection and analysis, particularly focused on contemporary qualitative and quantitative methods									
cognizant of the needs of special populations									
evaluation of the potential for more and worse disasters, and appreciate the need for a more proactive approach to disaster management									

Each subject assigns work required to achieve a certain competence. Each university professor engaged in creating of NDRM master curricula have to devise learning activities based on the specific subject contents. Thus, transporting of competencies into the classroom will end with the subject content and the time needed for its mastering.

## 4 Occupational fields

The expected employment opportunities include access to:

- Public and private authorities in charge of natural disaster risk management (national, provincial, municipal);
- Professional firms and consulting firms employing structural, civil or environmental engineers;
- Public or private research institutes applied to the study of the conditions of the environment and risk management (University, research centre, etc.);
- Emergency services planning and managing crisis situations;
- International agencies (United Nations, European Union, non-governmental agencies, etc.).

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