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CATALOGUE OF COMPETENCIES

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University of Nis

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Contents

List of abbreviations

AUTh	Aristotle University of Thessaloniki
BOKU	University of Natural Resources and Life Sciences, Vienna
CBHE	Capacity Building in Higher Education
EACEA	Education, Audiovisual and Culture Executive Agency
EHEA	European Higher Education Area
EQF	European Qualification Framework
HE	Higher Education
HEI	Higher Education Institution
NEO	National Erasmus Office
NMBU	Norwegian University of Life Sciences, Norway
PWMC VV	Public Water Management Company ''Vode Vojvodine''
SWARM	Strengthening of master curricula in water resources management for the Western Balkans HEIs and stakeholders
UACEG	University of Architecture, Civil Engineering and Geodesy, Bulgaria
UNI	University of Nis, Serbia
UL	University of Lisbon, Portugal
UoM	University of Montenegro
UNIRIFCE	University of Rijeka, Croatia
UNMO	Dzemal Bijedic University of Mostar
UNS	University of Novi Sad
UNSA	University of Sarajevo
UPKM	University of Pristina in Kosovska Mitrovica
TCASU	Technical College of Applied Sciences Urosevac with temporary seat in Leposavic
WB	Western Balkan
WRM	Water Resources Management

1. Introduction

In order to improve existing curricula or to develop new competence-based master curricula in WB partner HEIs in line with Framework for Qualification of the EHEA for the second cycle and European Qualification Framework (EQF) level 7 the Bologna Process requirements, the specific students' competences and learning outcomes are defined in the catalogue of competencies. Specification of necessary competencies for professional practice is based on recognized deficiencies of professional knowledge, skills and attitudes that arise from previous considerations given in project reports.

Holistic approach to water resources management requires professionals with multiple competencies. The catalogue summarizes three types of competencies:

1) generic (key, cross-curricular, core or transferable competencies across study areas),

2) engineering competencies, and

3) water resources management competencies.

There is global demand for effective water resource managers and consultants with an appreciation of the challenges of effective environmental management within a range of sectors. Successful water management is dependent on the development of integrated solutions. This requires social, political, institutional, legal and financial, as well as scientific, technical and environmental awareness and understanding.

Students interested in environmental or water resource management may have a range of backgrounds, including engineering, agriculture, environmental science or physical geography.

1. Catalogue of competencies

Requirements for employees dealing with water resources management are wide-ranging and demanding. They should have knowledge and understanding of science in conjunction with applied and practical skills.

1.1 Definition of competencies

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

Following Weinert (2001), we take a broad view and refer to competence as "*combinations of those cognitive, motivational, moral, and social skills available to (or potentially learnable by) a person [...] that underlie the successful mastery through appropriate understanding and actions of a range of demands, tasks, problems, and goals*."

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 SWARM 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 SWARM 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 1).

Table 1 Descriptors defining the seventh level in the EQF

EQF Level	Knowledge	Skills	Competence
Level 7	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 Critical awareness of knowledge issues in a field and at the interface between different fields	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	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

1.2 Competence-based master study programs in water resources 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 water resources management (WRM) will perceive following requirements:

- specificity of topic on water resources 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 WRM, future master curricula should compound knowledge about water phenomena, specific modern and innovative technologies and multiple social needs. New master curricula should provide knowledge and deeper understanding of science in relation with the applied and practical skills. The curricula should be designed to give graduates in water resources management an understanding of the scientific as well as organizational, social and economic issues facing the management of water resources.

A graduate degree in water resources prepares students for a variety of careers that deal with water in many contexts: scientific, economic, and social. Because the field of water resources is so complex and broad, water resource graduate programs tend to be interdisciplinary and allow students to choose a track and courses most suited to their career goals. Students interested in this type of graduate degree should have a strong background in the natural, physical, and social sciences related to the field of water resources in order to be competitive in the graduate school admission process.

Theoretical part should critically follow the very rapid pace of innovation in water resources management related scientific and technical domains. 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 different water resources systems.

Graduates should be aware that measures for dealing with water resources 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.

Graduates of a master degree programme will acquire the competencies that have to be in accordance with policy and operational frameworks. They 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 WRM, 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 different problems in WRM within relevant policy frameworks.

Due to the fact that water has huge impacts on different sectors, the management of water resources requires knowledge about valid national legislation i.e. institutional framework for action in different 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 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 WRM 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 management.

New master curricula will be integrated in national efforts for regulation and improvement in the field of WRM 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 SWARM project implementation such as Report on WB regional issues related to WRM, Report on EU water policies and innovation and EU recommendations and legislation in water sector, Report on master curricula related to WRM in EU and WB partner countries, and Report on innovative practices for WRM in EU.

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.

2. SWARM catalogue of competencies

Integrated Water Resources Management (IWRM) is field that requires multiple competencies related to **knowledge** which covers complex nature of Water Management 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:

1) generic (key, cross-curricular, core or transferable competencies across study areas),

2) engineering competencies, and

3) water resources management competencies.

2.1 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

- communicating, verbally and in writing, clearly and effectively,
- critical thinking,
- scenario modeling,
- creativity,
- initiative,
- prediction of solutions and consequences,
- collaboration,
- working in multidisciplinary team,
- working autonomously,
- working in an international context,
- generating new research ideas,
- 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 WRM,
- experience-based critical decision making,
- staying up-to-date with technological development,
- holistic and proactive approach to WRM situations,
- clearly and unambiguously transfer knowledge to the professional and wider public,

- applying knowledge in practice,
- retrieving, analyzing and synthesizing data and information, with the use of necessary technologies,
- designing and managing projects,
- respecting natural environment,
- demonstrating social, professional and ethical commitment and sensitivity to gender issues,
- being critical and self-critical,
- using acquired theoretical and practical knowledge to solve unseen engineering problems,
- presenting written technical reports to others and to make oral presentations that are reasoned, logical and time-limited, to a variety of audiences,
- responding to written material critically, effectively and efficiently,
- presenting ideas, key facts, problem solutions and results effectively, both orally and in writing, in a variety of settings including group/team work.

2.2 Engineering competencies

The cross-curricular themes of SWARM 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. The technical and scientific parts will contain comprehensive tools in WRM. Multi- and inter-disciplinarity will be achieved through the solving of real life management problems.

Completion of the master SWARM curricula provides students with the following engineering competencies:

- understanding the wider context of the engineering discipline, its practical applications, societal impact and limitations,
- acceptance of the general principles and practices of engineering professional codes of conduct,
- following general laboratory, workshop and/or fieldwork safety guidance and precautions,
- mastering of methods, procedures and processes of risk identification,
- statistical data processing to define and make adequate conclusions,
- 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,
- using appropriate engineering software packages as an aid to research, analysis, problem solving and presentation,
- using computer systems to access learning resources, receive communications regarding the degree programme, undertake assessments and submit assignments,
- preparing technical drawings by hand (following appropriate training),
- producing sketches to communicate ideas and concepts,
- using appropriate equipment competently and safely (following appropriate training),
- forming logical, reasonable conclusions and make sound recommendations based on available data and/or observations,
- obtaining necessary data from scientific and technical documents, reports, and other reference materials,
- undertaking work with a high level of initiative and commitment to the task in hand,
- preparing, processing, and interpreting data and/or observations using appropriate techniques,

- defining objectives for simple projects in a variety of disciplines and to develop and implement basic work plans,
- drafting proposals, funding requests, and requests for proposals,
- defining information needs, including needs for research, inventory, baseline studies, and follow-up monitoring,
- developing innovative solutions to complex or intractable issues,
- using acquired theoretical and practical knowledge to solve new engineering problems,
- presenting written technical reports to others and to make oral presentations that are reasoned, logical and time-limited, to a variety of audiences,
- presenting ideas, key facts, problem solutions and results effectively, both orally and in writing, in a variety of settings including group/team work.

2.3 Water resources management competencies

Students will be faced with a complex and interrelated nature of master curricula courses. After graduating they acquired detailed knowledge in WRM and the ability for solving specific problems using the scientific methods and procedures as well as for anticipation and application of novelties in practice.

Completion of the master SWARM curricula provides students with the following water resources management competencies:

- understanding of climate changes, hydrological hazards and their effects on WRM,
- devising strategies and developing methodology and methods of emergency as part of WRM,
- optimizing and managing available resources in WRM systems,
- applying ICT in WRM,
- development of human resources in WRM,
- applying specialized civil engineering fields in WRM,
- writing documents dealing with natural resource issues and technical information, drawn from a variety of sources,
- understanding of the Water Framework Directive and its implementation processes,
- using of mathematical models for the simulation of water related processes,
- understanding the environmental pricing concept with emphasis to the value of the water,
- understanding the hydrologic cycle, the various natural processes and the simulation methods,
- defining the interaction of water with other sections, the water-energy-food-environment (WEFE) nexus approach,
- obtaining knowledge on the EU legislation for the water resources,
- applying modern tools that facilitate the spatiotemporal management of the water resources. Geographic Information Systems (GIS) and WRM,
- identification and analysis of problems in WRM,
- holistic and proactive approach to WRM issues,
- respecting natural environment,
- identifying needs and priorities, including facilitation of group efforts to define and prioritize broad water resource program needs,
- implementing water supply and water efficiency plans and programs.

2.3 Translating competencies into courses

Course contents of WRM master curricula will be realized in line with previous defined specific competencies that determine the actual content of each course. The WB HEIs will define courses (mandatory and elective) regarding their scientific area, expertise, knowledge base, technical competences, skills and tools. Table 2 shows link between competencies and courses.

Table 2 Link between competencies and courses

		MANDATORY COURSES			ELECTIVE COURSES		
		MC1	MC2	...	EC1	EC2	...
Generic Competencies	communicating, verbally and in writing, clearly and effectively						
	critical thinking						
	scenario modeling						
	creativity						
	initiative						
	prediction of solutions and consequences						
	collaboration						
	working in multidisciplinary team						
	working autonomously						
	working in an international context						
	generating new research ideas						
	intensive use of ICT in acquiring knowledge and solving problems						
	solving complex multidisciplinary problems in theory and practice applying acquired knowledge						
	social and civil responsibility						
	development of professional ethics and responsibility						
	effective leadership						
	strategic thinking						
	experience-based critical decision making						
	staying up-to-date with technological development						
	knowledge transfer to the professional and wider public clearly and unambiguously						
	applying knowledge in practice						
	retrieving, analyzing and synthesizing data and information, with the use of necessary technologies						
	designing and managing projects						
	demonstrating social, professional and ethical commitment and sensitivity to gender issues						
	being critical and self-critical						
	responding to written material critically, effectively and efficiently						

Engineering Competencies	understanding the wider context of the engineering discipline, its practical applications, societal impact and limitations						
	acceptance of the general principles and practices of engineering professional codes of conduct						
	following general laboratory, workshop and/or fieldwork safety guidance and precautions						
	mastering of methods, procedures and processes of risk identification						
	statistical data processing to define and derive adequate conclusions						
	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						
	using appropriate engineering software packages as an aid to research, analysis, problem solving and presentation of results						
	using computer systems to access learning resources, receive communications regarding the degree programme, undertake assessments and submit assignments						
	preparing technical drawings by hand (following appropriate training)						
	producing sketches to communicate ideas and concepts						
	using appropriate equipment competently and safely (following appropriate training)						
	forming logical, reasonable conclusions and make sound recommendations based on available data and/or observations						
	obtaining necessary data from scientific and technical documents, reports, and other reference materials						
	undertaking work with a high level of initiative and commitment to the task in hand						
	preparing, processing, and interpreting data and/or observations using appropriate techniques						
	defining objectives for simple projects in a variety of engineering disciplines and developing and implementing basic work plans						
	drafting proposals, funding requests, and requests for proposals						
	defining information needs, including research needs , inventory, baseline studies, and follow-up monitoring						
	developing innovative solutions to complex or intractable issues						
	using acquired theoretical and practical knowledge to solve new engineering problems						
	presenting written technical reports to others and to make oral presentations that are reasoned, logical and						

	time-limited, to a variety of audiences						
	presenting ideas, key facts, problem solutions and results effectively, both orally and in writing, in a variety of settings including group/team work						
WRM Competencies	understanding of climate changes, hydrological hazards and their effects on WRM						
	devising strategies and developing methodology and methods of emergency as part of WRM						
	optimizing and managing available resources in WRM systems						
	applying ICT in WRM						
	development of human resources in WRM						
	applying specialized civil engineering fields in WRM						
	writing documents dealing with natural resource issues and technical information, drawn from a variety of sources						
	understanding of the Water Framework Directive and its implementation processes						
	using of mathematical models for the simulation of water related processes						
	understanding the environmental pricing concept with emphasis to the value of the water						
	understanding the hydrologic cycle, the various natural processes and the simulation methods.						
	defining the interaction of water with other sections, the water-energy-food-environment (WEFE) nexus approach						
	obtaining knowledge on the EU legislation for the water resources						
	applying modern tools that facilitate the spatiotemporal management of the water resources. Geographic Information Systems (GIS) and WRM						
	identification and analysis of problems in WRM						
	holistic and proactive approach to WRM issues						
	respecting natural environment						
	identifying needs and priorities, including facilitation of group efforts to define and prioritize broad water resource program needs						
	implementing water supply and water efficiency plans and programs						

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

3. Learning outcomes

Learning outcomes are the formulations of all that the learner knows, understands and can do after completing a learning process.

Learning outcomes are used as a tool for curriculum design.

- Describing a lesson in the form of learning outcomes demonstrates an example shift from teacher-centered to student-centered approach as interest shifts from content (what the teacher will teach) to the result (what a student can do if he/she successfully complete the program).
- Learning outcomes should correspond to a certain number of ECTs. Each credit unit corresponds to 25-30 hours of student work.
- In addition to its credit value, each learning outcome is associated with a certain level of achievement. The Greek National Qualifications Framework (EQF) sets eight levels, but this number may be different in other contexts.
- The assessment of learning outcomes is conducted through exams, which is why exams are essential. The exams should focus on the learning outcomes and should be done appropriately and formulate assessment criteria.

Although the achievement of learning outcomes determines the performance of students, the learning outcomes are usually conceived as limits, that is, they specify the minimum requirements for the student to pass the course. It is therefore important to avoid over-specialization.

Learning outcomes must be those that represent the core learning for a course. There should therefore be a small number of learning outcomes that are of fundamental importance rather than a long list of less important outcomes. However, learning is not always pre-planned and in many courses (especially the most creative ones) students are expected to follow their own path through the course. In such cases, professors can devise 'open' learning outcomes to express this. Each lesson should have between four and eight learning outcomes. It is also important that learning outcomes are written consistently to ensure clarity between lessons.

The fundamental principle that governs the formulation of learning outcomes horizontally and vertically lies in the use of "one-word active voice verbs". This practically means that the description of learning outcomes must emphasize a specific action of the student by using active voice verbs.

At the beginning of the wording there should be an active verb, followed by the object of the verb, as well as a short phrase that gives a summary of the meaning of the learning outcome.

- Use only one verb for each learning outcome.
- Avoid using verbs such as "to know, to learn, to be familiar with ..., to draw attention, etc.". Such formulations are more related to learning objectives than to learning outcomes.
- Avoid complex and lengthy proposals. If a complex proposal is required, two or more proposals are proposed for the sake of clarity.
- Learning outcomes should be objective and measurable.
- Keep in mind the timetable within which the learning outcomes are produced.
- The description of learning outcomes should be evaluated at a later stage. The more general their wording, the more difficult it is to evaluate them effectively.
- Prior to finalizing the learning outcomes, the proposed formalities should be shown to colleagues and, possibly, to students in test form, in order to check the clarity of their content.

Learning Outcome Formulation:

Upon successful completion of the course, students will: (*DO WHAT (and how)*)

Where can one start?

If you have a description of your course, this can be the starting point for determining your learning outcomes. Otherwise you can:

- Try to transform the learning objectives of the lesson into learning outcomes.
- Make a list of the knowledge, skills, and abilities you expect your students to have achieved at the end of the lesson.
- Think about the professional requirements that exist for this subject.

Examples of formulating learning outcomes

Example 1

- Learn of the basic structures in computer programming.
- Programming structures in a high-level programming language (Fortran 90/95/2003 or C ++).
- Solve mathematical problems with the help of a high-level programming language. Emphasis is given to the solving algorithm.

Example 2

Students are expected during the course to:

- Develop their own musical skills in basic musical knowledge through the use of voice and manipulation of simple rhythmic and melodic musical instruments
- Understand the theoretical axes of Music Education and its peculiarities in preschool age
- Link theory to practice through experiential involvement in music activities
- Become familiar with the organization and presentation of audio stories in order to assimilate basic musical knowledge within the collaborative process
- Become familiar with the design and organization of music activities for the kindergarten

Example 3

- Understand the key features of qualitative research and understand its role in special education
- Learn how to collect qualitative data
- Practice on participatory observation and interviews with adults and children
- Awareness of methodological and practical issues that may arise from the researcher's involvement in the field of study
- Practice on the analysis and interpretation of qualitative data

For every domain the levels covered by the learning outcomes of the course should be selected (Table 3).

Table 3 Domains and learning outcomes

Cognitive Domain		Affective Domain		Psychomotor Domain	
☐	Creating	☐	Characterization	☐	Naturalization
☐	Evaluating	☐	Organization	☐	Articulation
☐	Analysing	☐	Valuing	☐	Precision
☐	Applying	☐	Response	☐	Manipulation
☐	Understanding	☐	Reception	☐	Imitation
☐	Remembering				

The levels that correspond to the learning outcomes of the course, irrespective of the level of studies (undergraduate / postgraduate) should be selected (Table 4). The learning outcome level definitions provide an estimate of the demands of the course for the benefit of students and curriculum designers alike.

Table 4 Knowledge, skill and competence levels

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. For example, in the context of the Greek National Qualifications Framework, knowledge is described as theoretical and/or factual knowledge.		Skill means the ability to apply knowledge and use know-how to complete tasks and solve problems. For example, in the context of the Greek National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. For example, in the context of the Greek National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☐	Level 7	☐	Level 7	☐	Level 7
☐	Level 6	☐	Level 6	☐	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

3.1 Learning outcomes in water resources management

Graduates of the course are expected to be able to:

- demonstrate basic understanding of scientific problems involved in the management of water;
- combine a limited range of science and management methods for integrated water resources management issue;
- understand management fundamentals to solve current problems and to anticipate, mitigate and prevent future problems in the area of water resources management;
- identify social, political, economic and environmental impacts on water resources management;
- communicate satisfactorily both orally and in writing, the nature of, and solution to, water resources management issues and problems.
-

3.2 Learning outcomes selections by WB HEIs

The specific section presents the learning outcomes that were selected by the WB HEIs during the implementation process of the specific Action, namely Action 2.1, of WP2. The information is provided in tabulated form for each WB Institution. The material depicted in this section comes from questionnaires that were distributed among the partners.

3.2.1 Technical College of Applied Sciences Urosevac

Students who will complete the Specialist professional study Water protection study programme will be competent and qualified to solve complex problems related to water protection theoretically and practically. Competencies include the development of critical and independent opinions, problem analysis skills, solution synthesis, prediction and behavioral calculation of the chosen solution with a clear idea of what the good and the bad sides of the chosen solution are.

The competencies that the students will acquire upon the completion of the specialist professional studies are comprised to the:

- Ability to demonstrate theoretical and practical knowledge and understanding of water protection and all necessary actions;
- Ability to apply acquired knowledge in solving complex problems in new or unknown environment;
- Ability to integrate theoretical and practical knowledge, solve complex water protection related problems on the basis of information obtained;
- Ability to convey in a clear and unambiguous manner the knowledge and conclusions to professional and general public;

Moreover, Graduate students will be able to:

- Recognize, analyze and formulate engineering problems and based on that offer optimal and high quality solutions.

- Through the internship program within the companies dealing with water protections students will acquire a sufficient practical knowledge and will be trained to use, analyze and implement technologies related to water protection.
- Integrate information and data from various resources, as well as to draw appropriate conclusions;
- Carry out experimental and other project tasks, as well as to analyze and present the results, and to associate managerial and engineering judgments in order to optimize work and business results.

Students will be trained to design, organize and operate water and environmental systems. During schooling, the student gains the ability to independently plan and conduct statistical processing of results, as well as to formulate and draw appropriate conclusions.

General Competences

The General Competences that are intended by the proposed courses are:

- ☒ Apply knowledge in practice
- ☒ Retrieve, analyze and synthesize data and information, with the use of necessary technologies
- ☒ Adapt to new situations
- ☒ Make decisions
- ☒ Work autonomously
- ☒ Work in teams
- ☒ Work in an international context
- ☒ Work in an interdisciplinary team
- ☒ Generate new research ideas
- ☒ Design and manage projects
- ☒ Appreciate diversity and multiculturality
- ☒ Respect natural environment
- ☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
- ☒ Be critical and self-critical
- ☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as the/or ethical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☐	Level 7	☐	Level 7	☐	Level 7
☒	Level 6	☒	Level 6	☒	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - Serbian National Qualifications Framework is in line with the European Qualification Framework

3.2.2 University of Nis

By completing undergraduate Engineering Management study programme, the students acquire the following general competencies:

- identifying, describing and solving engineering problems,
- applying fundamental knowledge to solve practical problems in construction,
- using common computer tools for document creation, presentation, budgeting and simulation,
- sharing information, ideas, problems and solutions with people in and outside the profession,
- collaboration in team professional work,
- taking an ethical stance in solving engineering problems,
- continuing education in graduate academic studies in engineering management or other related fields.

Engineering Management is a program that combines engineering courses with business management principles. Students obtain a comprehensive engineering education consisting of planning, scheduling, monitoring, and control of engineering projects while developing business expertise, social awareness, and organizational communication skills. On the bachelor's level, Engineering Management is a four-year degree that immerses students in a multidisciplinary field that deals with the technical, financial, strategic, and human resources components of the program. Graduates of this degree apply their experiential knowledge and skill set necessary for practical problem solving to address the complexities of the discipline.

General Competences

The General Competences that are intended by the proposed courses are:

- ☒ Apply knowledge in practice
- ☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
- ☒ Adapt to new situations
- ☒ Make decisions
- ☒ Work autonomously
- ☒ Work in teams
- ☒ Work in an international context
- ☒ Work in an interdisciplinary team
- ☒ Generate new research ideas
- ☒ Design and manage projects
- ☒ Appreciate diversity and multiculturality
- ☒ Respect natural environment
- ☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
- ☒ Be critical and self-critical
- ☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as theoretical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☒	Level 7	☒	Level 7	☒	Level 7
☒	Level 6	☒	Level 6	☒	Level 6

☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - Serbian National Qualifications Framework is in line with the European Qualification Framework

3.2.3 Dzemal Bijedic University of Mostar

By completing undergraduate Civil Engineering study programme, the students acquire the following general competencies:

- applying fundamental knowledge to solve practical problems in construction,
- using common computer tools for document creation, presentation, budgeting and simulation,
- sharing information, ideas, problems and solutions with people in and outside the profession,
- collaboration in team professional work,
- taking an ethical stance in solving engineering problems,
- continuing education in graduate academic studies in civil engineering or other related fields.

Through undergraduate programme, the student acquires the following competencies specific to the field of Civil Engineering:

- organization and management of smaller sites,
- designing smaller and simpler objects.
- analysis, understanding and drawing of projects,
- performing laboratory testing of building materials.
- execution of construction works on all types of low-capacity buildings,

General Competences

The General Competences that are intended by the proposed courses are:

☒ Apply knowledge in practice
☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
☒ Adapt to new situations
☒ Make decisions
☒ Work autonomously
☒ Work in teams
☒ Work in an international context
☒ Work in an interdisciplinary team
☒ Generate new research ideas
☒ Design and manage projects
☒ Appreciate diversity and multiculturality
☒ Respect natural environment
☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues

☒ Be critical and self-critical
☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as theoretical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☒	Level 7	☒	Level 7	☒	Level 7
☒	Level 6	☒	Level 6	☒	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - European Qualification Framework

3.2.4 University of Novi Sad

By completing the Master's Degree Program in Water Treatment and Protection at the University of Novi Sad, Faculty of Technical Sciences, the student acquires general academic and personal skills for:

- critical and self-critical evaluation of arguments, assumptions, concepts and data in decision making,
- solving problems in a creative way,
- implementation of advanced computational models in solving technical problems,
- communication with the international environment,
- application of acquired knowledge in further academic education,
- research activities to analyze and solve specific problems in theory and practice.
- demonstrated theoretical knowledge and understanding in the field of environmental engineering, also increased by the knowledge gained at undergraduate studies. It is the basis to develop critical and independent thinking;
- apply knowledge for solving complex problems in the new or unknown environment;
- ability to integrate knowledge, solve complex engineering problems and to reason on the basis of information available, including considerations and responsibilities;
- ability to clearly and unambiguously transfer the knowledge and way of reasoning to professionals and general public;
- ability to continue their studies in individual way.

Through programme mastering, the student acquires the following competencies specific to the field of Water Treatment and Protection:

- design and construction of water treatment facilities
- preparation of pre-investment studies and valuation of construction works and structures,
- application of methods for assessing the environmental impact of construction facilities and technical environmental measures in the process of planning, designing, constructing and maintaining the facilities.

General Competences

The General Competences that are intended by the proposed courses are:

☒ Apply knowledge in practice
☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
☒ Adapt to new situations
☒ Make decisions
☒ Work autonomously
☒ Work in teams
☒ Work in an international context
☒ Work in an interdisciplinary team
☒ Generate new research ideas
☒ Design and manage projects
☒ Appreciate diversity and multiculturality
☒ Respect natural environment
☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
☒ Be critical and self-critical
☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as theoretical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☒	Level 7	☒	Level 7	☒	Level 7
☐	Level 6	☐	Level 6	☐	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - Serbian National Qualifications Framework is in line with the European Qualification Framework

3.2.5 University of Sarajevo

By completing the Master's Degree Program in Water Treatment and Protection of University of Serajevo, the student acquires general academic and personal skills for:

- critical and self-critical evaluation of arguments, assumptions, concepts and data in decision making,
- solving problems in a creative way,
- implementation of advanced computational models in solving technical problems,

- communication with the international environment,
- application of acquired knowledge in further academic education,
- research activities to analyze and solve specific problems in theory and practice.
- demonstrated theoretical knowledge and understanding in the field of environmental engineering, also increased by the knowledge gained at undergraduate studies. It is the basis to develop critical and independent thinking;
- apply knowledge for solving complex problems in the new or unknown environment;
- ability to integrate knowledge, solve complex engineering problems and to reason on the basis of information available, including considerations and responsibilities;
- ability to clearly and unambiguously transfer the knowledge and way of reasoning to professionals and general public;
- ability to continue their studies in individual way.

Through programme mastering, the student acquires the following competencies specific to the field of Water and Environmental Engineering:

- demonstrated capacity to solve problems by applying basic engineering and scientific principles, engineering processes and generic skills
- design and construction of all types of hydrotechnical-construction,
- design and construction of all types of structures in the field of geotechnics,
- development and implementation of construction and equipment management projects,
- preparation of pre-investment studies and valuation of construction works and structures,
- provide technical and commercial management
- application of methods for assessing the environmental impact of construction facilities and technical environmental measures in the process of planning, designing, constructing and maintaining the facilities.

General Competences

The General Competences that are intended by the proposed courses are:

☒ Apply knowledge in practice
☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
☒ Adapt to new situations
☒ Make decisions
☒ Work autonomously
☒ Work in teams
☒ Work in an international context
☒ Work in an interdisciplinary team
☒ Generate new research ideas
☒ Design and manage projects
☒ Appreciate diversity and multiculturality
☒ Respect natural environment
☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
☒ Be critical and self-critical
☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as theoretical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☒	Level 7	☒	Level 7	☒	Level 7
☒	Level 6	☒	Level 6	☒	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - Serbian National Qualifications Framework is in line with the European Qualification Framework

3.2.6 University of Montenegro

By completing the Master's Degree Program of Water Engineering of University of Montenegro, the student acquires general academic and personal skills for:

- critical and self-critical evaluation of arguments, assumptions, concepts and data in decision making,
- solving engineering problems in a creative way,

- implementation of advanced computational models in solving technical problems,
- communication with the international environment,
- application of acquired knowledge in further academic education,
- research activities to analyze and solve specific problems in construction theory and practice.

Through programme mastering, the student acquires the following competencies specific to the field of Water Engineering:

- demonstrated capacity to solve problems by applying basic engineering and scientific principles, engineering processes and generic skills
- design and construction of all types of hydrotechnical-construction,
- design and construction of all types of structures in the field of geotechnics,
- development and implementation of construction and equipment management projects,
- preparation of pre-investment studies and valuation of construction works and structures,
- Provide technical and commercial management,
- application of methods for assessing the environmental impact of construction facilities and technical environmental measures in the process of planning, designing, constructing and maintaining the facilities.

General Competences

The General Competences that are intended by the proposed courses are:

☒ Apply knowledge in practice
☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
☒ Adapt to new situations
☒ Make decisions
☒ Work autonomously
☒ Work in teams
☒ Work in an international context
☒ Work in an interdisciplinary team
☒ Generate new research ideas
☒ Design and manage projects
☒ Appreciate diversity and multiculturality
☒ Respect natural environment
☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
☒ Be critical and self-critical
☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as theoretical and/or factual knowledge.		Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) skills.		Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
☒	Level 7	☒	Level 7	☒	Level 7
☒	Level 6	☒	Level 6	☒	Level 6
☐	Level 5	☐	Level 5	☐	Level 5
☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
☐	Level 2	☐	Level 2	☐	Level 2
☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

* - Serbian National Qualifications Framework is in line with the European Qualification Framework\

3.2.7 University of University of Pristina in Kosovska Mitrovica

By completing undergraduate Civil Engineering study programme, the students acquire the following general competencies:

- identifying, describing and solving engineering problems,
- applying fundamental knowledge to solve practical problems in construction,
- using common computer tools for document creation, presentation, budgeting and simulation,
- sharing information, ideas, problems and solutions with people in and outside the profession,
- collaboration in team professional work,
- taking an ethical stance in solving engineering problems,
- continuing education in graduate academic studies in civil engineering or other related fields.

Through undergraduate programme, the student acquires the following competencies specific to the field of Civil Engineering:

- design and construction of high-rise buildings and associated facilities,
- design and construction of hydro-technical facilities and hydro-technical infrastructure of lower capacity,
- design of construction organization and technology,
- execution of construction works on all types of low-capacity buildings,
- knowledge and application of various building materials and appropriate technologies,

- application of computational models for solving engineering problems in construction,
- reviewing the principles for environmental impact assessment of building structures.

General Competences

The General Competences that are intended by the proposed courses are:

- ☒ Apply knowledge in practice
- ☒ Retrieve, analyse and synthesise data and information, with the use of necessary technologies
- ☒ Adapt to new situations
- ☒ Make decisions
- ☒ Work autonomously
- ☒ Work in teams
- ☒ Work in an international context
- ☒ Work in an interdisciplinary team
- ☒ Generate new research ideas
- ☒ Design and manage projects
- ☒ Appreciate diversity and multiculturality
- ☒ Respect natural environment
- ☒ Demonstrate social, professional and ethical commitment and sensitivity to gender issues
- ☒ Be critical and self-critical
- ☒ Advance free, creative and causative thinking

Learning Outcomes Categorization

The selected levels, for every domain, which cover the courses learning outcomes are:

Cognitive Domain		Affective Domain		Psychomotor Domain	
☒	Creating	☒	Characterization	☒	Naturalization
☒	Evaluating	☒	Organization	☒	Articulation
☒	Analysing	☒	Valuing	☒	Precision
☒	Applying	☒	Response	☒	Manipulation
☒	Understanding	☒	Reception	☒	Imitation
☒	Remembering				

Levels of Intended Learning Outcomes

The learning outcome level for the proposed courses are:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the Serbian National Qualifications Framework*, knowledge is described as	Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the Serbian National Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of	Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the Serbian National Qualifications Framework, competence is described in terms

theoretical and/or factual knowledge.		methods, materials, tools and instruments) skills.		of responsibility and autonomy.	
☐	Level 8	☐	Level 8	☐	Level 8
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☐	Level 4	☐	Level 4	☐	Level 4
☐	Level 3	☐	Level 3	☐	Level 3
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☐	Level 1	☐	Level 1	☐	Level 1
☐	No choice	☐	No choice	☐	No choice

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4. Career opportunities

Water resource professionals with a good integrated understanding of the diverse social and economic, as well as scientific factors of water resource management are highly sought after by employers.

Students undertaking further study in water resource management go onto a diverse range of careers with consultants, environmental regulators, non-government organisations (NGOs), government ministries, water companies and local authorities.

The expected employment opportunities include access to:

- Public and private authorities in charge of water resources 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 water resources management (University, research centre, etc.).

4.1 Jobs on labour market in the field of water resources management

The following jobs can be found in real life on labour market (source https://www.indeed.com/q-Water-Resource-Management-jobs.html?vjk=ef16c3fb583fa7b9):

Water Resources Analyst

Under general supervision or direction, the Water Resources Analyst oversees, monitors, coordinates and conducts one or more environmental programs; performs hydrologic, biotic, chemical, and physical monitoring, modeling, research and analysis; writes reports, correspondence and a variety of other materials in support of Water Department programs and for purposes of environmental regulatory compliance; designs and conducts restoration projects; reviews permits/proposals for development activities; designs and coordinates education and public outreach regarding assigned programs; performs public outreach regarding assigned programs, and performs other related duties as assigned.

Typical Duties

- Performs hydrologic monitoring according to Departmental standards; measures streamflow to develop and maintain streamflow rating curves to validate hydrologic models; build and maintain stream gages.
- Creates graphics for reports and presentations.
- Performs monitoring of fisheries; including fish passage/habitat conditions and water quality; botanical surveys, special status species, bypass flow, and water surface elevation in support of City operations and for compliance with offsite mitigation plans, Habitat Conservation Plans, Streambed Alteration Agreements, and other local, state and federal permits.
- Performs chemical and physical water quality parameter monitoring including chlorine residual, copper, turbidity, salinity, pH, conductivity, temperature, and sediment in coordination with other sections and departments.

- Completes and reviews regulatory reports, memos, and other documents such as water rights filings, permit related documents, hydrologic reports, and biotic reports for regulators and/or for internal use in accordance with local, state, and federal requirements.
- Participates in management of environmental programs, including requests for proposals and sole source requests to provide materials and services; coordinates and participates in the evaluation of submittals; assists in negotiation and execution of contracts; prepares Council items for contract approval; administers and manages contracts ensuring compliance with all requirements.
- Develops, implements and evaluates goals, objectives, policies and priorities for assigned projects and service areas; ensures that established goals and priorities are achieved.
- Coordinates with state and federal agencies to develop standard operating procedures, best management practices, and guidelines to meet regulatory and permit requirements; provides training to City staff and contractors.
- Monitors watershed lands in coordination with Water Recreation staff to identify erosion issues and code compliance issues such as illicit diversions or discharges; documents and follows appropriate channels to address.
- Provides environmental regulatory support services for water system repairs and related operations, as well as capital improvement projects, including review of work plans and preparation of technical memos and regulatory reports.
- Develops curriculum, coordinates, and leads classroom/field watershed education and outreach programs; assists in planning of annual watershed symposium and other stakeholder events; and presents to regulators and at public meetings.
- Analyze data and engage with other sections in the Department in water supply planning efforts.
- Follows safety regulations, policies, and procedures applicable to the assigned work.

Water Resources Lead

The Water Resources Lead will provide senior level technical leadership in the relevant domain, performing technical tasks and will also lead business development with state, local, and private sector clients. It is expected that the selected individual will work on ongoing projects and contracts, and will support business development in future (i.e., a seller-doer role).

Responsibilities

- Manage and lead complex water and environmental projects with domain experience in one or more of these areas: water resources, water quality, hydrogeology, environmental modeling, aquatic ecology or related disciplines.
- Contribute to successful business development for new projects by preparing proposals and grant applications for new and existing clients.
- Collaborate with other business units and offices throughout the country to identify and target opportunities, then develop effective project capture plans.
- Develop strategic, joint venture partnerships for major water resource projects, and leverage client relationships as a resource to identify prospective partnerships.
- Assess state and local emerging policy/plans/programs, and apply this knowledge to anticipate the scope and timing of major grants, RFPs, and SOQs opportunities.
- Mentor and train professional/technical staff.

Water Quality Analyst

The ideal Water Quality Analyst will be able to perform a variety of physical, chemical, biological and bacteriological analyses of water using sophisticated laboratory instruments and equipment.

Successful candidates will also be able to troubleshoot and resolve customer water quality inquiries and complaints, and provide necessary data used for water quality reporting requirements.

Exercises technical and functional supervision over technical staff as appropriate; may perform administrative duties of Laboratory Supervisor in the absence of the supervisor.

Examples of Duties

The following duties are typical for this classification. Incumbents may not perform all of the listed duties and/or may be required to perform additional or different duties from those set forth below to address business needs and changing business practices.

Important responsibilities and duties may include, but are not limited to, the following:

- Perform a variety of standard laboratory chemical, microbiological and physical analyses of water samples.
- Collect and preserve water samples at designated locations within water treatment plant and distribution system, including related data on chain of custody.
- Interpret laboratory test results and coordinate necessary changes in treatment operations with plant personnel.
- Coordinate laboratory operations, services and activities; develop and implement new and revised laboratory testing procedures; ensure compliance with applicable regulations and quality control standards.
- Provide training and technical assistance to plant operations personnel regarding appropriate sampling and laboratory testing procedures.
- Supervise and train assigned lower level technical laboratory staff in the collection and analysis of water samples.
- Input and retrieve a variety of text and data using a computer terminal.
- Respond to public inquiries in a courteous manner; provide information on water condition and treatment; resolve complaints in an efficient and timely manner.
- Perform related duties and responsibilities as required.

When assigned to Analytical:

- Interpret analytical data to identify problems which may occur during sampling, transporting, storing and laboratory processes; determine probable causes and recommend corrective measures.
- Assist in the development of specifications for and evaluations of laboratory services, equipment and supplies; maintain laboratory equipment, materials and supply inventory; and make recommendations regarding the purchase of laboratory equipment.
- Set up, calibrate, operate, perform and keep accurate records of maintenance on a variety of complex laboratory equipment and instruments.

When assigned to Regulatory:

- Compile and prepare various records and reports related to water quality regulatory monitoring and process control requirements.
- Work with commercial laboratories and requisition specialized testing as appropriate.
- Confer with representatives of governmental agencies, industrial organizations, water agencies and associations and others on matters relating to water quality issues and regulations.

Water Resources Manager

Typical Duties

- Plans and directs the operation, construction, maintenance, and repair of the water, production, treatment and distribution system, including groundwater production and groundwater basin management, as well as the management of imported water supplies.
- Plans and directs the operation, construction, maintenance, and repair of the wastewater collection and conveyance system; included is also operation and maintenance of portions of the local storm drainage system within the city, as well as management of the Water Resources Protection group.
- Plans and directs the operation, construction, maintenance, and repair of the wastewater reclamation facilities and major wastewater pumping station(s).
- Directs water conservation policies, alternative water source projects and other capital projects consistent with City Council direction to achieve and maintain water self-sufficiency.
- Directs the preparation of budget requests and supporting data.
- Establishes division policies and directs procedures for customer service and meter reading.
- Consults with city staff and/or coordinates with private consultants, as needed, for the performance of revenue studies and establishment of new rate structures.
- Serves as staff liaison with the city's imported water provider, with the city's contract provider of wastewater treatment services and with other agencies as required by regional, state or federal laws.
- Prepares written reports and recommends policies and strategies to address issues related to water, wastewater, storm drain systems, industrial waste discharges, alternative water sources and environmental issues.
- Selects, trains, supervises and evaluates the work of professional, technical, labor and administrative support staff. Assigns work activities and projects and monitors work flow.
- Develops and monitors employee performance goals, objectives and measures.
- Responsible for goal-setting, planning, organizing, budgeting, and implementing programs, methods, and procedures leading to effective and efficient performance and productivity.
- Performs other related duties as assigned.

Water Resources Planning Advisor

A Water Resources Planning Advisor is a professional classification assisting in developing high-level policy advice; performing administrative work in maintaining active liaison with all organizations having water related interests; advising the Water Resources Department and city management regarding water policy matters that ensures a sustainable supply of water resources; and assuring comprehensive representation of the city interests in intergovernmental agreements and protecting the city's investments in joint ventures. Duties include: representing the city and serving as a liaison to local and regional water resource groups and agencies, regulatory bodies, and other government agencies; oversight and administration of city's various agreements; interacting and eliciting information from other city departments in order to carry out the city's objectives relating to water resource management; advising the Water Resources Department and city management regarding water policy matters; assuring comprehensive representation of the city interests; providing direction and monitoring Operations Maintenance (O/M) and 5-year Capital Improvement Project (CIP);

coordinating with water operation staff to ensure compliance with the State Groundwater Management Act; assisting the Water Resources Advisor in short and long-range water planning activities including research, analysis, issue identification, projections and related tasks; leading and negotiating Intergovernmental Agreements (IGAs) with outside entities (JEPA, AJ, Greenfield, Val Vista, Tempe, Gilbert); providing highly technical and strategic planning assistance and recommendations on use of groundwater, surface water, and reclaimed water; interpreting, applying, and ensuring compliance with the provisions of water resources regulations and other applicable federal, state, and local codes, laws, rules, regulations, etc.; and assisting with the development and administration of the city's water resource master plan. The incumbent also serves as a technical analyst that maintains and analyzes data for water resource planning and contract compliance; prepares various reports and applications for state regulatory bodies, including the Arizona Department of Water Resources annual water use reports; provides information and technical assistance in the development and implementation of the city's water resource program, including working with local and regional water resource agencies, other city agencies, the public, and water system customers and users; assists in researching issues related to the city's water rights, water supply and demand, and effluent supply and demand; produces technical reports and analyses on water use and supply; develops and maintains water production and consumption information files and databases; and performs related duties as required.

The Water Resources Planning Advisor provides independent, highly complex support for water resource programs and is required to exercise extensive initiative and judgment to coordinate information and provide accurate data based upon research and information at hand to assist in policy development.

Water Resources Planning Manager

The individual selected for this position will assist the City's long-range efforts to build a reliable and sustainable raw water system. The Water Resources Planning Manager will lead updates to the City's Water Supply Master Plan and will be responsible to construct and maintain the City's surface water allocation modeling system. Other duties include providing strategic support in water supply development, oversight of consultants, contractors, and staff; coordination with stakeholders; technical support for Water Court activities; project administration; and program management.

This position requires a self-motivated candidate with sound technical, modeling, and problem solving skills who can work independently. The position offers significant opportunity for advancement.

Essential Functions

- Coordinate and provide technical support to update the City's Water Supply Master Plan.
- Provide strategic input on water supply development programs; manage said programs.
- Implement updates to the City's water allocation modeling system.
- Implement the Greeley Water and Sewer Board's water resources policies and plans.
- Make presentations and recommendations to the Deputy Director, W&S Director, W&S Board, and Staff on water resource planning issues.
- Provide technical assistance for Water Court activities.
- Coordinate with the development community and other stakeholders to ensure adequate water dedication.
- Review and approve consultants scopes of work and managing budgets.
- Develop, implement, and communicate policies and concepts in a clear and understandable manner.

- Develop principled relationships with local and regional water user groups, government agencies, ditch companies, and the agricultural community.
- Interact with City employees and the public in a professional, conscientious and effective manner.

Water Resource Specialist

Responsible for overall water sourcing, collection, and distribution to hydraulic fracturing operations in CLR's Southern Region. Coordinate with Completion Engineers, Production Personnel, and Field Foremen to assure adequate water supplies and rates. Coordinates with and manages numerous service companies for spill free hydraulic fracturing water delivery. Responsible for evaluating water sources, temporary pipeline routing, and ensuring economic and ethical water supply solutions are implemented.

Duties/Responsibilities

- Assist in establishing turnkey water fees and assist in generating invoices associated with water sales.
- Coordinate/supervise water transfer set up and job execution to deliver water to fracturing operations.
- Work with Completion Engineers and Facility Engineers to establish best water management practices for produced and freshwater jobs, i.e. Coordinating and executing third party pressure testing on all produced water jobs, ensuring piggable setups, ensuring pressure kills are installed and tested on pumps when necessary, secondary containment, etc.
- Work with CLR's internal Construction Group on mutually beneficial water/surface agreements.
- Work with the Construction Group on pit infrastructure requirements, i.e. 45k bbl pits and larger storage impoundments when necessary.
- Review all water transfer invoices to ensure accuracy and compliance with pricing agreements.
- Verify that all supporting documentation is submitted and accurate per the pricing agreements, i.e. landowner agreements, county/state permits, pre and post job checklists, etc.
- Liaises with Completion Engineers, Facility Engineers and Production field personnel to maximize utilization of water recycling facilities and pipeline infrastructure. This includes maximizing freshwater availability on company owned land and tracking produced volume and matching to upcoming frac demand to determine how much additional water needs are present.
- Assist in establishing pit usage fees and generating invoices based on pit usage.
- Work with CLR's internal Supply Chain on RFP's for new vendors and renewals with existing vendors.
- Work with in-house regulatory personnel on county and state regulation of interest to water transfer.
- Coordinate the installation of third party biocide manifolds in water transfer pipelines.
- Work with service companies on pre-job sampling.
- Other duties may be assigned.

Water Quality Manager

Specific duties include:

- Supports the Company's Mission, Vision and Values.

- Collaborates with third party contractors and Capital Project Manager to review and approve the equipment and construction packages for accuracy, compliance and completeness.
- Oversees the daily operation of the Resource Recovery Center to best practice standards to include:
    - Maintaining biothane systems to include pumps, heat exchangers, chillers, boilers, etc.
    - Daily testing of VFA's, COD's, & TSS.
    - Collecting and shipment of all samples for offsite testing.
    - Maintaining organized records for any changes or data that are collected.
    - Monitors critical systems from offsite and serves 24/7 for emergency backup of production.
    - Maintaining proper inventory of supplies and back-up components.
- Through collaborative efforts with operations management, maintenance and subcontractors ensures optimal machine and material performance.
- Directs new and on-going environmental compliance tasks related to air, water and pollution prevention.
- Serves as the main point of contact for State & County inspectors and ensures compliance with all activities and maintains all necessary documents for reviews, as needed.
- Collaborates with operations management to continually recognize and assess possible plant improvements.

Water Manager

The Water Manager upholds the organizational Vision, Mission, and Values, and the strategies of the management team. Builds and fosters collaborative relationships with each District department, works, and influences across department lines to accomplish established goals. Updates colleagues on projects and activities. Updates impacted departments of operational problems or explain procedural changes or practices. Prepares monthly operations reports for the Board Reports. Prepares Standard Operating Procedures (SOP), Policies, Board Memos etc. as needed.

The Water Manager oversees, coordinates and builds consensus among the departments regarding master planning activities with the goal to reduce regulatory risk and meet future demand. Works with the engineering and finance department to plan for the financing of proposed major upgrades and expenditures as a result of the plan. This role also prepares an annual budget for operations and maintenance, capital projects, sampling events planning efforts and consultants as needed. Works effectively cross-departmentally on complex projects, water quality matters and team development. Works with water, field operations, OTS, laboratory and engineering staff etc. to develop estimated costs for operations, maintenance, personnel, and capital and life cycle upgrades to facilities. Works with the finance department as appropriate during the budget process for Board approval. Oversees the fiscal responsibilities of the water and OTS departments, ensures that the best value is realized for the District for expenditures. Tracks and oversees all expenditures for the Department.

The Water Manager oversees and participates in the implementation of capital and life cycle upgrades to water treatment facilities in coordination with the Engineering Department when necessary. Attends design and construction meetings when appropriate, reviews change orders and keeps apprised of design and construction changes, budgets, schedules, staffing etc. Oversees contracts and consultant relationships related to department projects and provides project management when necessary.

5. References

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