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CREATING THE NETWORK OF KNOWLEDGE LABS FOR SUSTAINABLE AND RESILIENT ENVIRONMENTS

NEEDS, POSSIBILITIES AND CONSTRAINTS FOR NEW CURRICULUM DEVELOPMENT

WP 1.2 REPORT

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NEEDS, CONSTRAINTS AND POSSIBILITIES FOR NEW CURRICULUM DEVELOPMENT

THE FACULTY OF TECHNICAL SCIENCES, KOSOVSKA MITROVICA

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Contents

Summary

The study presented in this report falls within the scope of the Work Package 1.2: **Analysis of needs, constrains and possibilities for curricula development at the Faculty of Technical Sciences in Kosovska Mitrovica**.

It includes:

- general introduction with explained common need for study programmes (extract from the application),
- analysis of national regulations in terms of higher education and the level concerned, and comparison with the application proposal,
- national state in the fields sustainability and resilience: regulations, practice, existing study programmes and gap detection,
- consideration of national qualification framework and comparison with the European standards in higher education,
- institutional capacities in terms of development of study programme (institutional description, staff capacity, equipment, space (premises), relevant knowledge base at lower levels of education - bachelor and master studies, existing teaching methodology, virtual mobility practice, etc.) and the comparison with application proposal,
- educational material in national language about Sustainable and Resilient Environments - availability, scope and subjects,
- review of European comparable study programmes, delivered by five EU KLABS partners' researchers,
- the survey done among students and working professionals for the assessment of knowledge about sustainability and resilience, critical issues recognition and actual practice review, and
- discussion and conclusions with the starting curriculum contour, by which the aim of this study was fulfilled.

1. INTRODUCTION

The original idea for the project titled CREATING THE NETWORK OF KNOWLEDGE LABS FOR SUSTAINABLE AND RESILIENT ENVIRONMENTS (acronym KLABS) was born from educational and research activities and related awareness about the complex existing conditions. Project formula is research-oriented, meaning that the methodology for its development is based on realistic problem definition or, in other words, need for the project.

Indeed, the included region, that is Western Balkan, today is faced with significant challenges in the fields of sustainable development and adaptation to climate change; these challenges are visible in both urban and rural built environments, where the second are often undeservedly more underestimated.

Sustainability and resilience are two separate, but strongly interrelated concepts. The development process and its main credo by which the needs of present generation must be met in a way which will not compromise the ability of future generations to meet their own needs today is compounded by manifestation of past unsustainable actions in society - the climate change. Increased pressure on the environment thus doesn't origin just from the population, their activities or technology, but as well from the nature itself. Therefore, the sustainability - preservation or upgrade of the possibilities for future generations, and the resilience - development of adaptive capacity of the social environments to the climate change consequences, need to be studied concurrently.

Despite the scientifically proved facts, the measures to achieve sustainability and resilience in practice are rarely applied in subject Region. One of the main reasons for the current state is the lack of knowledge. "Malpractice" leaves significant and permanent damage in the environment and contributes to the increment of environmental, but as well social and economic risks.

In regard to the said, the project intends to contribute to the preparedness for coping with, managing and shaping the conditions of growing complexity. Through capacity building, the project aims to create the base for equipping the professionals with new competences and skills necessary to respond to the recognized needs of today's society and job market.

The overall broader objective is to support the modernization of higher education in WB Region by implementing strategic approach in the development of **innovative platform for the delivery of knowledge about sustainable and resilient environments.**

To define the form and scope of knowledge delivery, foreseen by KLABS project, the current state in higher education sector in included Western Balkan countries was studied. It was concluded that the separate study programmes related to sustainability are rare and mostly focused on energy aspect, while the programmes which would include comprehensive education on both sustainability and resilience do not exists at all.

The two topics are in overall rarely present in existing university curricula and are mostly delivered to the students in a form of isolated theoretical classes; this separation from the curriculum backbone reflect negatively on knowledge integration and its practical application in professional work and real life situations. Additionally, the past generations of students didn't get any in-institutional education in

subject themes. Finally, to understand the two concepts and their complexity one must own the sufficient broader professional knowledge and skills.

All these considerations led to the conclusion that incorporation of the themes of sustainability and resilience into existing study programmes would not bring completely satisfying results, although would certainly help to develop knowledge base.

This is why KLABS project proposes the introduction of new postgraduate study programmes Sustainable and Resilient Environments. By doing this, the possibility to gain the knowledge opens not just to graduated students, but also to all working professionals who completed their studies long time before the terms sustainability and resilience were introduced at all, and they are therefore considered as important and large target group to be impacted by project.

2. QUALIFICATION FRAMEWORK AND SPECIALISTS STUDIES – European and national scales

Even though the initiatives have largely been started and several drafts have already been developed, the National Qualification Framework (NQF) has not been formally adopted yet. By official recognition of the Framework, it is believed that stronger links between education and job sector will be established – detailed description of knowledge, skills and competencies gained upon completion of a study programme will constitute, according to the Qualification Framework drafts, an integral part of diploma certificate.

National Qualification Framework will include all segments of education grouped into 8 levels, where levels 6-8 belong to higher education sector. This catalogue of qualifications will contain description of learning outcomes corresponding to each level, regardless of the method and area in which a qualification is obtained. To the greatest extent, National Qualification Framework drafts reflect European standards and European Qualification Framework (also encompassing eight levels).

European Qualification Framework (EQF) is a common reference platform aiming to connect national qualification frameworks and acting as a means of harmonisation between various educational systems and countries in Europe. Having regarded that the NGF has still not been adopted and that its newest draft is compatible with the European standards, the EQF will be a base for the development of new postgraduate curriculum Sustainable and Resilient Environments at the Faculty of Technical Sciences in Kosovska Mitrovica.

According to general description of the studies to be developed in the framework of KLABS project and presented in approved project application, new curricula falls into Level 7 of European Qualification Framework, supported by the following descriptors[1]:

EQF level	*Knowledge*	*Skills*	*Competence*
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

At the Level 7 of the EQF, learning relates to the study of unknown circumstances and requires problem solving with the assistance of various interrelated factors some of which the individual learner do not

[1] Descriptors defining levels in the European Qualifications Framework (EQF). https://ec.europa.eu/ploteus/en/content/descriptors-page, accessed on 20.03.2016.

necessarily have to be familiar with[2]. Many factors are changing with the time, thus creating learning context which is characterised by complexity and uncertainty. The learning in general is highly specialised. Qualifications at the Level 7 enable employment and career continuation in a specialised (or narrowly connected) field, at the same time opening the road to further higher education.

Formal studies for the qualifications at Level 7 are usually carried out in specialised higher education institutions; the studies are built on knowledge and understanding acquired at previous Level 6. The learning is characterised by individual work and knowledge exchange with other individuals at the same or higher level. The working space is specialised and flexible enough to enable shaping of the work in line with individual learners' interests.

Qualifications at the Level 7 correspond to the second level of higher education in the Bologna system, i.e. to the second cycle in the Framework for qualifications of the European higher education area.

[2] Komnenović, B., Lažetić, P., Vukasović, M. (2010) Nacionalni okvir kvalifikacija. Beograd: Centar za obrazovne politike, http://www.erisee.org/sites/default/files/National%20qualifications%20framework%202010%20SR.pdf, accessed on 15.03.2016.

3. SPECIALISTS STUDIES
Comparative analyses of regulations, standards, project application, institutional and wider conditions

The National Law on Higher Education establishes academic and professional higher education and further classifies each of the two types, as shown in the Figure 1.

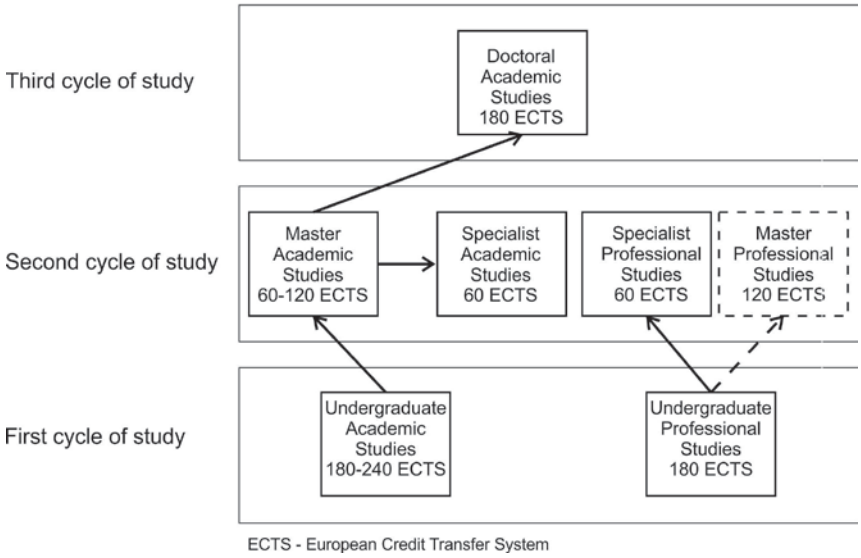


Figure 1: ***Classification in the higher education system***

Academic higher education is divided on:

- Bachelor studies (1st level of higher education, lasting 6-8 semesters and carrying in total 180-240 ECTS);
- Master studies (2nd level of higher education, lasting 2-4 semesters and carrying in total 60-120 ECTS);
- Specialist studies (2nd level of higher education, lasting at least 2 semesters and carrying at least 60 ECTS);
- Doctoral studies (3rd level of higher education, lasting 6 semesters and carrying 180 ECTS).

Specialist academic studies are regulated by the Law on Higher Education and accompanying legal documents. The standards and procedures for the accreditation are determined by National Council of Higher Education, while the accreditation process is led by the National Commission for Accreditation and Quality Control and conducted upon the submission of necessary documentation by higher education institution. The Commission is also the body that is issuing Accreditation Certificates.[3]

[3] Zakon o visokom obrazovanju (The Law on Higher Education), „Službeni glasnik RS“, br. 76/2005, 100/2007, 97/2008, 44/2010, 93/2012, 89/2013, 45/2015 i 68/2015

In order to obtain the Accreditation Certificate for a specialist study programme, higher education institution must comply with the set of 12 standards:

- Programme structure
- Programme purpose
- Programme objectives
- Gained competencies
- Curriculum
- Quality, contemporaneity and compliance with international programmes
- Enrolment and the number of students
- Evaluation and progression of students
- Teaching staff
- Organisational and material resources
- Quality control
- Distance learning system.

3.1. PROGRAMME STRUCTURE

3.1.1. LEGAL CRITERIA

Study programme contains elements predefined by law. These are: title of the study programme; description of the type of studies; organization of the studies; duration; obtained number of the ECTS; language; acquired professional/scientific/academic title; teaching/learning methods, and all other information necessary for precise programme definition.

There are no strict rules on the title of a study programme; it, however, should reflect programme content, and needs to be recognizable and distinguishing.

School year starts on the 1st of October and lasts for 12 calendar months. It may be divided on:

- **2 semesters** – each with the duration of 15 working weeks;
- **3 trimesters** – each with the duration of 10 working weeks;
- **blocks** – with total duration of 30 working weeks, where the duration of each block is defined by higher education institution.

Teaching at every course of a study programme, according to the regulations, is organized and carried out in a single semester, trimester, or a block. **The longest possible duration of a single course** is 2 semesters or 3 trimesters.

Teaching at a study programme can either be organised 1) in **national language** (Serbian), or 2) the overall study programme or certain parts or the final specialist exam are organised in the **language of a**

national minority or foreign language (in accordance with the institutional general act and only after the obtainment of the National Accreditation Certificate)[4].

As predefined by the National Law on Higher Education, **the minimum duration of a specialist study programme is 1 year – 60 ECTS** (2 semesters with 30 ECTS each); the sum of 60 ECTS corresponds to the total average engagements of the students during the **40-hour working week** and one school year. In accreditation documentation, the institution defines exact duration and accompanying number of ECTS for a subject study programme.

The Regulations on the list of professional, academic and scientific titles[5] define **professional, academic and scientific titles of the corresponding level of the education** acquired from the corresponding educational-scientific areas, as well as the abbreviations of the titles. The Regulations, inter alia, state that the professional, academic, i.e. scientific title is being determined by the study programme, and must be contained in diploma and its addition issued by the higher education institution implementing that programme.

According to the mentioned Regulations, **the specialist with at least 360 gained ECTS may obtain the title either as**:

A. Specialist with the indication of the title acquired upon completion of master studies from the corresponding area (for example "specialist engineer of architecture", or "specialist engineer of civil engineering"). In order to closely describe the meaning of title acquired, *The Regulations on the list of professional, academic and scientific titles* allow to add the words which closely define the title after the dash (for example, specialist engineer of architecture – sustainable built environment). The part of title behind the dash is defined during programme accreditation, based on the proposition from a higher education institution initializing the whole procedure.

B. In the case of development of interdisciplinary, multidisciplinary and transdisciplinary study programmes, determination of the title is based on combination of parts of the two most important educational-scientific areas[6] **included in that programme**. The most important educational-scientific areas are determined based on the allocation of the size of teaching/learning material, number of classes and ECTS. Valid *Regulations on the list of professional, academic and scientific titles* so include the following titles acquired upon completion of interdisciplinary/multidisciplinary/transdisciplinary specialists studies: - specialist engineer of energy efficiency of buildings; - specialist engineer of urbanism and regional development; - specialist engineer of landscape architecture; - specialist ecologist for the environmental protection rights; etc.

[4] Zakon o visokom obrazovanju (The Law on Higher Education), „Službeni glasnik RS", br. 76/2005, 100/2007, 97/2008, 44/2010, 93/2012, 89/2013, 45/2015 i 68/2015

[5] Pravilnik o listi stručnih, akademskih i naučnih naziva, „Službeni glasnik RS", br. 30/2007, 112/2008, 72/2009, 81/2010, 39/2011, 54/2011 and 44/2013

[6] Educational-scientific areas are defined by National Council of Higher Education. For **technical-technological educational-scientific field, educational-scientific areas are the following**: 1. Architecture; 2. Biotechincal sciences; 3. Civil Engineering; 4. Goedesy; 5. Electrical and computer engineering; 6. Industiral Engineering and Engineering Management; 7. Environmental Protection Engineering & Work Protection Engineering; 8. Mechanical Engineering; 9. Organisational Sciences; 10. Mine Engineering; 11. Geology Engineering; 12. Traffic Engineering; 13. Technological Engineering; 14. Metallurgical Engineering.

3.1.2. INSTITUTIONAL CONDITIONS

Specialist study programmes at the Faculty of Technical Sciences in Kosovska Mitrovica have not been organised to-date. Foreseen programme on Sustainable and Resilient Built Environments thus contributes to the educational offer enrichment.

3.1.3. PROJECT APPLICATION

KLABS project foresees development and implementation of specialist studies at the Faculty of Technical Sciences with the duration of 2 semesters (60 ECTS credits).

3.1.4. WIDER EXISTING CONDITIONS

In national higher education system, there currently exist three specialist study programmes that may be brought into relation with the general concept of Sustainable and Resilient Built Environments, and one programme partially tackling built environment.

Programme ***Energy Efficient and Green Architecture*** at the Faculty of Architecture of the University of Belgrade deals with the principles of green, energy efficient buildings and LEED building rating system. The specialist studies last 2 semesters and carry 60 ECTS credits in total.

Specialist programme ***Energy Efficiency, Maintenance and Assessment of the Value of Buildings*** at the Faculty of Civil Engineering of the University of Belgrade is organised in three separate modules. The programme lasts 2 semesters and carries 60 ECTS credits in total.

Specialist study programme ***Energy Efficient Buildings*** at the Faculty of Technical Sciences of the University of Novi Sad also lasts 2 semesters and has 60 ECTS in total. This institution also organises other specialist programmes with longer duration, such as *Specialist Studies of Architecture* (3 semesters and 91 ECTS in total) and ***Environmental Protection Engineering*** (also with the duration of 3 semesters and carrying 90 ECTS credits in total).

3.2. PROGRAMME PURPOSE

3.2.1. LEGAL CRITERIA

In general, the purpose of a higher education study programme is recognized as the education of students for recognizable and clear professions and occupations. A study programme provides acquisition of competencies that are socially justified and useful.

Valid legal documents set distinct condition in terms of the necessity to define the purpose of a study programme in accordance with the main tasks and objectives of the higher education institution in which the programme will be carried out. The purpose of a study programme must be formulated clearly and unambiguously.

3.2.2. APPLICATION PROPOSAL

Environmental protection in engineering branches, architecture and construction refers to the design, development, analysis and implementation of wide range of appropriate technical-technological solutions, measures and practices. KLABS intends to modernize higher education provision in WB by developing new specializing study programmes and new professional profile prepared for coping with, managing and shaping of "conditions characterized by change, uncertainty, risk and complexity" (Sterling, 2012). Problem intricacy requires interdisciplinary approach.

Responsibility of engineers and architects in achieving sustainability and resilience of built environments is very significant, therefore new programmes will not make impact just on involved institutions, but as well on wide environment. In the long term, KLABS will impact the overall development of WB countries by delivering new generation of professionals capable of dealing with current recognized challenges.

3.3. PROGRAMME OBJECTIVES

3.3.1. LEGAL CRITERIA

Programme objectives include acquisition of the competencies and academic skills, and the methods of their gaining. The objectives may also encompass the development of creative competencies and mastering the specific practical skills necessary for successful professional work.

The objectives of a study programme comply with basic tasks and objectives of higher education institution at which the programme is implemented.

Programme objectives are clearly and unequivocally defined.

3.3.2. PROJECT AIM

Project KLABS supports the modernization of higher education in Western Balkans Region, by implementing strategic approach in development of innovative module-type postgraduate specializing educational programmes Sustainable and Resilient Environments that equip professionals with new competences and skills necessary to respond to the needs of today's society and job market. Framework for the implementation of new programmes is based on the cooperation and networking among all WB partners.

KLABS project foresees the development of multidisciplinary/interdisciplinary curriculum Sustainable and Resilient Environments, by synthesizing and harmonizing links between Architecture and construction, Engineering and engineering trades and Environmental protection. Innovative character of designed curricula, inter alia, reflects through development of flexible learning paths, open educational resources bases and virtual learning platforms, and creation of conditions for virtual mobility.

3.4. GAINED COMPETENCIES

3.4.1. LEGAL CRITERIA

Through programme mastering, students acquire general and field-specific competencies necessary for future highly professional and successful performance.

By completing study programme, the students acquire general competencies in terms of:
- analysis, synthesis and prediction of the solutions and consequences;
- mastering the methods, procedures and processes of research;
- development of critical and self-critical thinking and approaches;
- knowledge application in practice;
- development of communicational skills, as well as the collaboration at narrow and international scale;
- professional ethics.

By completing study programme, the students acquire field-specific competencies in terms of:
- profound knowledge and understanding of studied discipline(s);
- specific problem saving with the use of scientific methods and procedures;
- connecting the knowledge from different areas and its application;
- follow-up and application of the novelties;
- development of skills for knowledge application;
- use of information-communication technologies in knowledge mastering;
- design, organization and control of the field-specific processes;
- ability to individually carry out experiment, perform statistical analysis of obtained results, to formulate and bring conclusions;
- ability to present results in a suitable way;
- **possession of knowledge and skills related to environmental protection and efficient utilisation of national natural resources, in line with the principles of sustainable development.**

3.4.2. INSTITUTIONAL AND WIDER CONDITIONS

Acquired competencies correspond to the 7th level of European Qualification Framework, described in Chapter 2 of the report.

The review of internationally published papers reveals that different authors use different methodology and terminology for the definition of sustainability related competencies acquired during higher education. Murga-Menoyo (2014), De Hann (2010), Wiek at al. (2011) and several other authors introduce the category of general sustainability competencies in formal higher education; these should be acquired independently from field-specific sustainability related competencies (i.e., in the case of KLABS scope, independently from sustainability related competencies corresponding to technical-technological educational/scientific field). In conclusion, such a categorisation could be possibly be reflected in curriculum development through the introduction of, at the first place, **socio-cultural educational themes and sustainability friendly pedagogies**.

3.4.3. PROJECT APPLICATION

Highly skilled competitive professionals will be able to better respond to changing needs, conditions and job market. Obtained general and field-specific key competences, including transversal skills, and learning outcomes will be in line with European and national qualification framework. Employability outcomes are the important aspect of curriculum design. New professional profile increases diversity in community of professional engineers and architects within WB Region countries.

Upon completion of the studies, students will gain:

- critical awareness about sustainability/resilience concepts,
- highly specialized knowledge in sustainable/resilient environments,
- specialized skills needed to integrate knowledge from different fields, to work on real-life cases and to develop new knowledge,
- ability to identify, define, manage and offer (innovative) solutions to complex problems related to sustainability/resilience in different social (built) environments,
- responsibility in future professional work,
- ability to work in teams and to develop strategic performance,
- ability to communicate by using professional language and field-specific terms,
- ability to conduct experiments and assessments by using modern software and equipment, and to analyse and interpret results,
- ability to apply gained knowledge in practice,
- ability to manage projects on various scales.

3.5. CURRICULUM

3.5.1. LEGAL CRITERIA

Curriculum structure encompasses distribution of courses and modules over semesters, trimesters, i.e. over the blocks, the fund of active teaching hours and ECTS credit distribution.

1 school year = 60 ECTS; 1 ECTS = 25-30 working hours

1 school year = 60 x (25-30) = 1500-1800 working hours in all forms of engagement (active teaching, individual work, exams, etc.)

1 working week = 40 hours of work

The overall students' engagement is consisted of:

- **Active teaching**: 1. theoretical lessons, 2. exercises, 3. research study work[7], 4. other forms of active teaching. The total number of active teaching hours during the school year is at least 600 hours, distributed within 30 working weeks during the school year, which means that there are at

[7] For specialist studies, a **research study work** may be added to active teaching. These active working hours prepare the students for final work. Research study work is independent form of teaching and must be noted as a separate subject – course.

least 20 active teaching hours in every working week, **excluding final work and professional practice**[8].

- **Individual work**
- **Pre-exam knowledge tests and the exams**
- **Final work preparation**. The final work may be included in programme curriculum, but is not mandatory for specialist studies. Methodology and procedure for final work preparation and defence are regulated by general act of a higher education institution.
- **Voluntary community work** and other. Pro bono voluntary work, organised by a higher education institution, encompasses students' engagement on the project significant for local community. Conditions, organisation and evaluation of the voluntary work are regulated by institution's general act.

Each course may represent the combination of the abovementioned forms of engagement.

The courses are generally divided on mandatory and elective. Elective courses carry at least 30% of total number of ECTS of overall study programme.

Course description contains title, type, year and semester, number of ECTS credits, educators' name, course objective with expected outcomes, course content, recommended literature, teaching methods, methods for knowledge evaluation and other information.

The number of ECTS for a course = the total number of active teaching hours + the total number of other forms of students' engagement

***Example 1**: 6 ECTS course can have 6 hours of active teaching during the working week and 90 hours in total spent for indidivudal work, exams, etc. The overal number of hours of students engagement is:*

6 active teaching hours per week x 15 working weeks + 90 hours in other forms of students engagement = 180 hours in total / 25-30 hours per ECTS = 6 ECTS

***Example 2**: 6 ECTS course can have 4 hours of active teaching during the working week and 120 hours in total spent for indidivudal work, exams, etc. The overal number of hours of students engagement is:*

4 active teaching hours per week x 15 working weeks +120 hours in other forms of students engagement = 180 hours in total / 25-30 hours per ECTS = 6 ECTS

Regulations for the technical-technological educational/scientific field state that professional practice and practical work must be present in the programme curriculum for bachelor and master studies with at least 45 hours realized at adequate scientific research institutions, organisations dealing with innovation activities, industry and commerce sector, or public institutions. *It is not clear whether the rule applies to specialist studies as well.*

[8] Both the final exam (if it exists) and professional practice must be assigned with the ECTS credits and must be described as separate syllabi. The number of assigned ECTS to the final work and practice enters the overall sum of curriculum ECTS.

Similarly, regulations prescribe the percentage presence of courses in bachelor/master curriculum according to the type (general-academic; theoretic-methodological; scientific; professional-applicative) and the allocated number of ECTS. *It is not clear whether the rule applies to specialist studies as well.*

3.5.1.1. Lifelong learning

The Law on Higher Education states that the higher education institution may, within its scope of activities, organize lifelong learning programmes, besides organisation and implementation of accredited study programmes. The conditions, methods and procedure for lifelong learning programmes implementation are regulated by institutional general act. A person enrolled to a lifelong learning programme doesn't gain the status of a student; upon programme completion, he or she will be awarded with a certificate of completion.

3.5.2. PROJECT APPLICATION

To promote diversity and to avoid multiplication of the same programme, study programmes in all Partner Countries institutions will be designed following the principle of modularity. The modularity will also be promoted through development of curriculum of each Partner Country institution where at least one module related to sustainability and resilience of built environments, with specificities in regard to other modules/programmes, will be developed (this is why the term "network" stands in proposed title of the project).

3.5.3. INSTITUTIONAL CONDITIONS

There are no institutional obstacles for fulfilment of the criteria given in 3.5.1 and the objectives set by project application, given in 3.5.2.

Additionally, the possibility for extracting the parts of developed curriculum and their transformation into short lifelong learning programmes (described in chapter 3.5.1.1) may be further considered. The proposal is in line with the organisation of promotional courses foreseen in approved project application.

3.6. QUALITY, CONTEMPORANEITY AND COMPLIANCE WITH INTERNATIONAL PROGRAMMES

3.6.1. LEGAL CRITERIA

Developed study programme offers the latest scientific and professional knowledge in technical-technological field.

The programme is comprehensive and harmonized with other programs of a higher education institution.

The programme is aligned with at least three accredited foreign higher education programs of which at least two are being implemented in European educational space.

The programme is formally and structurally in compliance with established specific standards for technical-technological field.

Study programme is harmonized with European standards regarding enrolment conditions, duration of studies, finalisation and the applied pedagogies.

3.6.2. INSTITUTIONAL CONDITIONS

As stated above, legal standards set the rules for programme comprehensiveness and harmonization with other programs of a higher education institution. In order to deliver a programme which is harmonized with existing study programmes offered by a same institution, as well as to define profiles which could enrol to new studies, it is necessary to examine the scope of sustainability and resilience related topics studied at bachelor and master studies of five study areas at the Faculty of Technical Sciences in Kosovska Mitrovica: Architecture; Civil Engineering; Electrical Engineering; Environmental Protection Engineering and Technological Engineering.

3.6.2.1. Architecture

New programme in architecture at the Faculty of Technical Sciences has been significantly modified and improved in comparison with the version existed until 2014. With the support from the EU institutions: University of Ljubljana – Faculty of Architecture; Riga Technical University – Faculty of Architecture and the Built Environment and Technological Educational Institute of Athens, and together with the University of Montenegro – Faculty of Architecture (all participating in TEMPUS project "Restructuring the study programme in architecture to long-cycle integrated master in line with EU standards"; Ref. No. 530440; Duration: 2012-2016), the University in Kosovska Mitrovica – Faculty of Technical Sciences has developed, accredited and started to implement new architectural curriculum, for the first time containing, inter alia, courses or parts of the courses (as integrated themes) dealing with the sustainability of built environment (Table 1).

Semester	**Course title**	***Description of sustainability related content***
1	Introduction to Architecture	*Place and location. Natural and made conditions. Climate. Ecology and architectural design. Comfort: definition. Building envelope. Building materials. Landscape and landscaping.*
1	Urban Sociology	*Relationship between urban development, culture and economy. Sociology of everyday life, urban living, and architecture.*
2	Building Materials and Physics in Architecture	*Thermal properties of building materials. Insulation materials. Building comfort types in detail. Comfort parameters. Energy related calculations.*
6	Electrical Installations	*Smart buildings principles. Environmentally friendly smart building design principles. On-site energy generation. Photovoltaic systems and micro turbines.*
6	Mechanical Installations	*Energy efficiency and HVAC systems.*
6	Plumbing	*Water saving measures. Grey and black waste water recycling. Water heating. Pipe insulation.*
7	Green Architecture and Urban Design	*A series of topics aiming to point at the interventions in domain of architecture and urban design which are in the function of sustainable development, especially its environmental aspect. Through the work on the course, students acquire knowledge about environmentally friendly architectural and urban design*

		measures and the skills for knowledge implementation.
7	Light in Architecture	*Impact of the light on users' health and wellbeing. Measures to maximise daylight in interior. Energy efficient artificial lighting systems.*
8	Environmental Quality of Buildings	*Life cycle of buildings and of building materials, and their mutual adjustments. LCA analyses. International systems for environmental assessment of buildings. Energy certification of buildings.*
8	Architecture in Context	*A series of topics aiming to train students for understanding of architecture as a part of natural and social environment.*
8	Bioclimatic Design	*A series of topics aiming to train students for the application of bioclimatic principles in design work.*
8	Urban Renewal	*A series of topics related to urban renewal, regeneration and recycling.*
9	Landscape Urbanism	*Basic techniques, dynamics and discourse of landscape disciplines applied in the context of contemporary urban development.*
3-9	Design Studio	*Practical design work (problem solving) with the integration of sustainability principles elaborated in all previously mentioned courses*

Table 1: Sustainability related contents at Architecture study programme at FTS

Resilience related topics do not appear in significant scope in architectural study programme, neither as separate nor integrated content.

3.6.2.2. Civil Engineering

Accredited programme in Civil Engineering at the Faculty of Technical Sciences has been slightly modified and improved in comparison with the version existed until 2014. The following table 2 shows courses or parts of the courses (as integrated themes) dealing with the sustainability and resilience of built environment.

Semester	**Course title**	***Description of sustainability/resilience related content***
2	Fundamentals of Environmental Engineering	*Basic principles of environmental protection, sustainable design.*
4	Physics in Construction	*Thermal properties of building materials. Insulation materials. Energy related calculations.*
4	Hydrotechnics	*A series of topics aiming to train students for understanding of water use, protection against harmful effects of water and protection of water as a resource.*
5	Electrical Installations	*Smart buildings principles. Environmentally friendly smart building design principles.*
5	Mechanical Installations	*Energy efficiency and HVAC systems.*
5	Plumbing	*Water saving measures. Grey and black waste water recycling. Water heating. Pipe insulation.*
5	Contemporary Materials in Civil	*Ecological aspects of materials in construction. Recycling of the*

	Engineering	*materials.*
5	Hydro-technical Infrastructural Systems	*Water saving measures. Waste water treatment. On-site energy generation as a product of waste water treatment.*
7	Geographic Information Systems	*Data base of real estate cadastre. Data base of infrastructural cadastre.*
8	Energy Efficiency and Certification of Buildings	*A series of topics aiming to train students to calculate, design and construct energy efficient buildings. Energy certification of buildings.*
9	Structures in Hydrotechnics	*A series of topics aiming to train students to design structures that allow the water use, protection against harmful effects of water and protection of water as a resource.*
9	Construction of Hydro-Technical Infrastructure Objects	*Sustainability in construction of hydro-technical infrastructure objects.*
9	Risk Management and Sustainability in Construction	*Basic principles in risk management and sustainability in construction. Principles of social, economic and ecologic sustainability in construction.*

Table 2: Sustainability/resilience related contents at Civil Engineering study programme at FTS

3.6.2.3. Electrical Engineering

Due to the nature of electrical engineering studies, there exist a number of courses which correspond to general concept of Sustainable and Resilient Environments. These courses are given in Table 3. It should be noted that the Electrical Engineering programme has been recently upgraded in terms of introduction of topics related to renewable energy resources and energy efficiency, due to the involvement in Tempus CBHE project *Development of Training Network for Improving Education in Energy Saving – ENERGY* (530379; duration 2012-2015).

Semester	**Course title**	***Description of sustainability/resilience related content***
4	Probability and Statistics	*Methodology of the non-formal approaches to problem solving. Methodology of phenomena observation, interpretation and quantification. Assessment of the probability of occurrence of events and phenomena, based on given data and elements. Estimation of the basic expected values that characterise observed event (phenomenon) – statistic evaluation, hypotheses testing, etc. Application of statistic models in real-life situations.*
5	Low Voltage Electrical Installations	*Types of electric installations. Characteristics of the basic underlying components. Energy receivers. Standards and regulations in design and construction. Electrical installation in buildings and connections to the low voltage grids. Public lighting. Grounding and protection from high voltage installations. Lighting protection systems and components. New concepts, design, installation and management of the electrical installations with computer support.*
5	Elements of Power Systems	*Aboveground and underground power lines. Climatic conditions and calculations of the power lines. Cable lines. Power transformers. Users' area as an element of power system. Daily load calculations.*

6	System Modelling and Simulations	*Application of modelling and simulation in practice. Theory of modelling and simulations. Mathematical models of continual systems. Development of computer simulation models with the use of MATLAB/SIMULINK programme package.*
6	Distribution and Industrial Networks	*Characteristics of distribution networks. Characteristics of electricity consumption. Households as a part of consumption system. Industrial energy consumers. Energy supply of the settlements. Reliability and safety of distribution systems. Location and characteristics of energy transformers in distribution networks. Voltage control. Pak load calculations.*
7	Renewable Energy Sources	*Solar energy. Solar collectors. Photovoltaic conversions. Wind farms. Wind turbines. Small hydropower plants. Fuel cells. Biomass power plants. Micro turbines. Asynchronous generators. Systems for energy accumulation. The integration of renewable energy sources. Geothermal energy. Technical conditions for connection of small power plants to the distribution network.*
9	Decentralised Electricity Generation	*Advantages of decentralised electricity generation. Combined generation of heat and electricity. Small, mini and micro hydropower plants. Wind turbines. Solar photovoltaic systems. Other renewable energy sources. Storage systems. Micro networks for electricity supply.*
9	Integration of Renewable Energy Sources into Distribution System	*Principles of integration of renewable sources into distribution systems. Technology of energy conversion at renewable sources integration. Converters. Systems for electricity accumulation. Power flows. Integration of a large number of renewable energy sources. Micro networks.*
9	General Energetics	*Concept and types of energy. Production and consumption of energy and consequent risks. Fuels. Hydro energy. Solar energy. Biomass. Wind energy. Biogas. Geothermal energy. Processed liquid fuels from biomass. Nuclear energy. Cogeneration of energy systems. Energy balancing. International conventions and protocols on environmental protection.*

Table 3: Sustainability/resilience related contents at the Electrical Engineering programme at FTS

3.6.2.4. Environmental Protection Engineering and Technological Engineering

Semester	Course title	*Description of sustainability/resilience related content*
2	Chemical Parameters in Living and Working Environment	*Defining chemical parameters. Classification of chemical parameters. Chemical, physic-chemical and biochemical parameters. Toxic parameters. Chemical parameters of fire and explosion. Other chemical parameters. Chemical parameters of the working environment. Chemical parameters of the living environment. Chemical parameters of air. Chemical parameters of water. Chemical parameters of land. The standards and recommendations with allowed values of chemical parameters. Diagnostics of working and living environment*
2	Living Environment and Pollution	*Atmosphere: solar radiation and the vertical division of the atmosphere; stratosphere, ozone chemistry, depletion of the ozone layer; troposphere, the chemical composition of the air;*

		sources of air pollution; the most important pollutants in the air and the main global problems; origin and control of emissions of pollutants. *Hydrosphere: water distribution in nature; chemical composition of natural waters; basic chemical reactions in the water; sources of water pollution; the most important pollutants in water; physical-chemical reactions of pollutants; effects of pollution; control emissions of pollutants.* *Lithosphere: the formation and composition of the lithosphere; the origin and composition of the soil; texture, structure and profile of the land; physical-chemical processes in the soil; sources of pollution of land, roads and spreading harmful effects of pollutants*
4	Technology of Waste Processing and Disposal	*Sources and characteristics of solid waste; legislation; waste composition; physical, chemical and biological properties; handling of solid waste at the source; collection and transport; treatment methods (physical, chemical and biological); waste energy utilization and obtaining useful products by transformation of waste; waste disposal , reuse and recycling; integrated solid waste management.*
4	Sustainable Use of Natural Resources	*Natural resource,(in)exhaustible resources, EU Thematic Strategy as a framework for sustainable use of natural resources, natural resources and national strategy, elements of the environment that are regulated, the concept of integrated protection and control of the environment, Rio Conference and Agenda 21 , Conference in Johannesburg, the Convention on the protection of the environment, International organizations, EU regulations in the field of environmental protection, National regulations in the field of environmental protection.* *Global changes in the atmosphere, potential for global warming, medium global temperatures prediction, Regional impact of temperature changes, CDM projects, Systemic connections of the sustainable use of natural resources and the environment, the system of national accounts and the increase of national income as an indicator of sustainable development, Economic indicators.*
4	Soil Pollution and Remediation	*Physical-chemical principles (soil structure, colloidal systems, the impact of structure on the properties of the soil); characteristics of the soil pollutants (types, sources, behaviour); legislation; methods of sampling and monitoring; monitoring of land; testing of contaminated areas; Remediation of soil (biological, physical and chemical methods)*
5	Biotechnological Processes	*Methods and kinetic aspects of growing, growth, genetic and metabolic manipulation and immobilization of cells of microorganisms (bacteria, animal cells, plant cells) for use in a variety of biotechnological processes. The course is based on lectures and computational examples. The examples include calculations of kinetic growth and microbial production in different conditions, modes of cultivation and reactor solutions.*
5	Waste Water Treatment	*Origin and quality of waste water; conditions for discharging wastewater into the recipient; basic methods of treatment. Primary, secondary and tertiary waste water treatment and their composition in a single processing line. Basic physical-chemical*

		and biological processes for removing polluting substances from water; Design of plants for treatment of waste water.
5	Clean Technologies	*Principles and key elements of cleaner production. Balancing raw materials, heat and energy. Sustainable consumption and production. Recycling of the different materials. Waste reduction. Innovative technologies. Policies and strategies of cleaner production. Economics of cleaner production.*
5	Volatile Organic Compounds	*Classes of organic compounds classified as pollutants. Determination of the risk classes (reactivity class, flammability class, explosion class and the class of toxicity), their impact on wildlife (systemic, acute and chronic effects). The model for VOCs removal and remediation of the environment.*
6	System Reliability and Safety	*Reliability - terms, indicators, distribution functions. Methods of reliability testing. Methods of increasing reliability. Method for reliability analysis. Safety system - concept, structure, functions, objectives, indicators. Equivalence of the reliability and safety. Critical safety system. Risk and safety levels. Methods of identifying a security function (hazard and operability studies, checklists, fault tree, event tree, the method of probability). The methods of quantifying the level of safety (risk matrix and graphics). Reliability of technical systems of protection. Reliability operators. Technological solutions to increase the reliability of technical systems of protection and operators. Managing the reliability and safety systems.*
6	Industrial and Municipal Landfills	*General concepts and definitions; Legislation; Criteria for selection of landfill sites; Types of landfills; Methods of disposal and disposal of industrial and municipal waste; Physical-chemical principles (soil structure, colloidal systems); Characteristics of pollutants from industrial and municipal waste landfills; Waste and leachate; The closure of the landfill; The methods of sampling and monitoring; The remediation of industrial and municipal landfills (biological, physical and chemical methods).*
8	Methodology of Environmental Assessment	*Elements of environmental assessment (air, water, ecological and sociological aspects, risks, landscape and visual effects, etc.) and evaluation methodology.*
9	Theory of Risk Systems	*Systemic thinking introduction: development of systemic ideas, analytical and systemic thinking, systemic approach, systemic sciences. General systems theory – development and principles. System – performance, quality, measurement of the quality. System models. Management – term, elements and principles. Management system. Man in the management system – informational and managerial adaptability, causes and types of errors. Risk theory – term, difference between objective and subjective risk basis – indicators, quantification and risk types. Systemic risk understanding. Risk management – term, approaches, characteristics, elements, processes, planning, assessment, treatment and monitoring.*
9	Emergency Situations	*Terms, classification, characteristics, development phases. Natural disasters – earthquakes, landslides, floods, hurricanes, tsunami, natural fires, diseases. Technological disasters – classification based on the danger degree and cause. Ecological*

		disasters. Social emergency situations. Institutional framework for emergency situations management – politics, regulations, monitoring, insurance, etc.
9	Environmental Legislation	*Ecological laws – development and basic characteristics. Relation to other laws. Ecological politics (national and EU). Legal instruments of ecological protection. Ecological criminal acts. Ecological complaints and appeals. International organisations and environmental protection. European Council. Protection of the air, water, soil, and living world.*
9	Environmental Management	*The course offers a series of management topics needed for environmental problem solving.*

Table 4: Sustainability/resilience related contents at the Environmental Protection Engineering & Technological Engineering study programmes at FTS

3.6.3. PROJECT SCOPE

Application foresees within the Work Package 1.2. the contributions from Programme Countries partners in the form of analyses of good examples of existing European postgraduate programmes as a base for the alignment of developed programmes with European educational trends. At the same time, it is expected that the EU partners, being involved as experts in the Work Package 2 – Development of new postgraduate curricula, will profoundly review the drafts of new curricula, taking care about the harmonisation with European standards and trends.

3.7. ENROLMENT AND THE NUMBER OF STUDENTS

3.7.1. LEGAL CRITERIA

The number of students enrolling to a study programme is determined according to the social needs, available institutional spatial, staff and material capacities, and set norms corresponding to technical-technological field. The number of students in the group for theoretical classes is maximum 32. The number of students in the group for exercises is maximum 16. The number of students for laboratory work is maximum 8.

Entry rank list is formed based on: 1) success achieved in previous education and 2) results of the evaluation of the knowledge, skills and competencies. The scope and methods of evaluation depend on the character of a study programme.

The initiation of enrolment procedure at the institution must be announced publicly. The institution defines close enrolment conditions.

To enrol to specialist studies, a candidate must have at least 300 ECTS credits gained during previous education (bachelor and master studies).

Tuition fee is defined by higher education institution, for every school year separately.

3.7.2. INSTITUTIONAL CONDITIONS

Constraints were not detected; no specific conditions exist and should be established with new programme development.

3.7.3. PROJECT SCOPE

KLABS project application foresees enrolment of 20 students in the first year of new programme implementation.

The tuition during KLABS project implementation will be exempted.

3.8. EVALUATION AND PROGRESSION OF STUDENTS

3.8.1. LEGAL CRITERIA

The evaluation is carried out by continuous monitoring of students' work, and is expressed in points. The maximum number of points a student can acquire in a single course/subject is 100. A student acquires points through the work in class and by completing the pre-examination obligations, i.e. by taking exam. The minimum number of points student can earn by completing the obligatory tasks during the classes is 30, while the maximum is 70 points.

Each subject in a study program must have established clear and open way of gaining points.

The overall student's success on a course is expressed by grade ranging from 5 (failed) to 10 (excellent-outstanding).

For every mastered course/subject, student receives certain number of ECTS credits determined on the basis of work load and the application of a uniform methodology for all higher education study programs.

3.8.2. OTHER CONDITIONS

There are no additional conditions or constrains in regard to evaluation and progress of students at institutional, project or national scales.

3.9. TEACHING STAFF

3.9.1. LEGAL CRITERIA

Teaching staff at study programme has suitable and sufficient scientific-professional qualifications.

Every teaching staff member has **at least five recognized references** from the narrow educational/scientific area embodied in study programme, including: papers published in referent journals and conference proceedings, monographs, textbooks, review articles, patents, new technologies, etc.

The number of teaching staff corresponds to programme needs and depends on a number of courses and number of classes on those courses. Total staff number is sufficient to cover all active teaching hours at the study programme.

At least 70% of educators at study programme are permanently employed at the institution implementing that programme. In total, the institution applying for programme accreditation has at least 20 teachers with the PhD.

3.9.2. INSTITUTIONAL STAFF CAPACITY

The Faculty of Technical Sciences (FTS) in Kosovska Mitrovica consists of eight departments that offer 3 cycles of university education in: Architecture, Environmental Protection Engineering & Work Protection Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering, Industrial Engineering, Mining Engineering and Technological Engineering.

Expertise fields and interests of academic research staff create conditions for interdisciplinary, multidisciplinary and crossdisciplinary educational/scientific actions as one of the main goals in the development of innovative postgraduate courses.

Expertise areas of educators permanently employed at the Faculty of Technical Sciences, corresponding to the general concept of Sustainable and Resilient Environments, are shown in Table 5.

Department	*Expertise areas of teaching staff*
ARCHITECTURE (INCLUDING URBAN PLANNING)	Environmentally friendly design; ecological assessments in architecture and urban design; resilient built environment (1 Assist. Prof., PhD) Brownfield regeneration strategies; sustainable urban design (1 Assist. Prof., PhD) Architecture of crisis areas (1 Assist. Prof., PhD) Green construction techniques (1 teaching assistant, PhD candidate) Energy efficiency improvement in existing buildings (1 teaching assistant, PhD candidate) Urban sociology (1 Assist. Prof., PhD)
CIVIL ENGINEERING	Hydrotechnics (1 Assist. Prof., PhD) Topographic surveying (1 Assoc. Prof., PhD) Sustainable construction (1 Assoc. Prof., PhD) Construction materials (1 Assist. Prof., PhD)
ELECTRICAL ENGINEERING	Probability and statistics (1 Assoc. Prof., PhD) Low voltage electrical installations (1 Assoc. Prof., PhD) Power systems/generation (2 Full Prof., 1 Assoc. Prof., all with PhD) Renewable energy sources (1 Full Prof., PhD) System modelling and simulations (1 Assoc. Prof., PhD)
ENVIRONMENTAL PROTECTION ENGINEERING & TECHNOLOGICAL ENGINEERING	Environmental impact assessment; By-products, recycling and clean technologies (1 Assist. Prof., PhD) Eco-climatology; Emergency situations (1 Assoc. Prof., PhD) Volatile organic compounds (1 Assoc. Prof., PhD) Water recycling; Pollution with heavy metals; Clean technologies; Environmental quality management (1 Assoc. Prof., PhD)

	Green Chemistry (1 Assist. Prof., PhD)
MECHANICAL ENGINEERING	System analysis and risk theory (1 Full Prof., PhD) Thermo-technical systems; Thermal heat generation; Cooling systems (1 Full Prof., PhD; 1 Teaching Assist., PhD candidate)

Table 5: Expertise areas of teaching staff at the FTS corresponding to general concept of Sustainable and Resilient Environments

3.9.3. PROJECT SCOPE

KLABS project foresees upgrade of the competencies of teaching staff by organising staff trainings at the Western Balkan higher education institutions in the third year of project life.

3.10. ORGANISATIONAL AND MATERIAL RESOURCES

3.10.1. LEGAL CRITERIA

Higher education institution is obliged to provide adequate human, spatial, technical-technological, bibliographic and other resources necessary for programme implementation.

According to the regulations, an institution implementing study programme provides at least 4 sq. m of space per student (gross), i.e. at least 2 sq. m per student for the work in shifts.

The institution has in its possession amphitheatres, classrooms, teaching/learning laboratories, research laboratories, research/development units, technical centres, library with the reading room, and all other premises corresponding to programme nature and belonging educational/scientific field.

The institution also provides equipment for measurement and demonstrations, computers, and information-communication technology necessary for the scientific-professional and professional-applicative programme courses, i.e. for experimental, demonstrative and simulative educational activities.

Higher education institution possesses at least 100 library units relevant for programme implementation. Every course within study programme is covered with corresponding learning material available to students.

3.10.2. INSTITUTIONAL CONDITIONS

The Faculty of Technical Sciences has sufficient human and spatial resources necessary for new programme development, while on the other hand it lacks equipment and bibliographical units. Currently, there are less than 100 available units (in all languages) in the library, falling into scope of Sustainable and Resilient Environments. The major part of existing units were published in English and procured in the framework of Tempus RESARCH project.

3.10.3. WIDER CONDITIONS

To examine the availability and scope of published titles in national language, the search based on key words at academic virtual library data bases[9] was initially carried out. The search has further included analyses of books, journals, book of proceedings, scientific and research theses, monographs, etc. It was concluded that:

- The number of relevant publications translated from foreign to national language is scarce. There is a need for more translation work in the field.
- The topics related to sustainability of built environment significantly predominate over the resilience of built environment to climate change, where the latter are hardly present in published literature, and when so, are mostly focused on narrow scope and single discipline, available in the form of articles published in national journals, although this occurs rarely as well. The only exception to-date is collection of the works from the project '*Istraživanje klimatskih promena i njihovog uticaja na životnu sredinu: praćenje uticaja, adaptacija i ublažavanje'* (Beograd: Arhitektonski fakultet, 2013, ISBN 978-86-7924-118-4). It may be concluded that subjects related to resilience of built environment are not presented in organised way and in sufficient scope to allow for holistic approach, i.e. that there is a need for further elaboration of the subject.
- In terms of sustainability of built environment, the major part of publications focuses on singular aspect – i.e. the buildings, dealing predominantly with environmental sustainability segment. No publication in national language and dealing with economic and social sustainability of buildings in comprehensive, explanatory way has been found. Clearly, there is a need for further elaboration and synthetic presentation of the three interrelated sustainability pillars.
- Only one publication in national language deals with ecological economics, and one with environmental quality management (both published on 2000).
- In regard to environmental sustainability of buildings, studied publications deal either with its narrow segment – that is most often the energy efficiency, a segment of buildings – that are most often building envelope, HVAC systems, or lighting in architecture (1 monograph-textbook), or with the overall representation of different layers of building ecology (found just in three publications – 2 monographs and 1 book). Available publications, however, treat both new and existing buildings (the latter in the context of refurbishment for energy efficiency achievement). Several publications, though mostly based on obsolete standards, treat the elements of building physics (heat transfer, acoustics, humidity, etc.).
- No publication deals solely with ecological characteristics of building materials, neither with the methodology for ecological quality evaluation; partially, this topic is tackled in just two publications. There is a need for more work in this field.

[9] http://www.vbs.rs/cobiss/

- Publications encompassing environmental protection engineering rarely integrate studied topics with the built environment. Rather, this engineering knowledge remains isolated, and the gap between built environment related engineering fields (architecture, urban planning, civil engineering, etc.) and environmental protection engineering and technological engineering, on the other side, is still deep.
- There is just one publication in Serbian language dealing with the 'Theories and methodology for the study of the environment' (ISBN 978-86-86859-18-1) and establishing firm link with spatial dimension, and just one publication (doctoral dissertation) dealing with the comprehensive environmental assessment from architectural standpoint. It is necessary to produce more assessment related material both on architectural and urban level.
- In regard to the ecology of built environment on wider scale, there is a small number of publications available in national language. Some of the most relevant publications in the field are: Urban Ecology (ISBN 86-82657-19-8) and Rural Ecology (ISBN 86-82657-20-1).
- In regard to the sustainability of settlements, most of the publications deal with urban environments, and it is noticed that rural built environments are underestimated. Some of the found publications include 'Sustainable city: Design and Sustainable Development for Smarter and Healthier Communities' (ISBN 978-86-7924-157-3) and 'Sustainable city: Towards Environmental Sociology'.
- Even though there exist several publications dealing with urban infrastructure, no publications in Serbian language dealing with sustainable or resilient urban infrastructure has been found. The topics are sporadically present in the form of articles prepared for the conferences or published in national journals. The same applies to the topics related to urban water management.
- Greening is most likely the only measure that contributes to the overall improvement of ecological quality of built environment. In available national literature, however, it has hardly been recognised as such. Greening strategies thus are elaborated as a topic belonging to natural rather than to technical-technological field. There is a clear need to introduce units encompassing greening strategies as a part of healthy, sustainable and resilient built environment achievement.
- The publication which would deal with healthy built environment has not been published yet. There is just one publication titled 'Healthy housing' published about 20 years ago and dealing in detail with different types of indoor comfort.
- Sustainability was a general topic of various recent conferences organised nationally and having international significance. Accompanying books of proceedings contain variety of articles covering different narrow or wide segments of sustainability of built environments. Some of the organised conferences were: International GreenBuild Conference (2011); Sustainable Spatial, Urban and Rural Development of Serbia (2008); Strategic Framework for Sustainable development of Serbia (2004); etc.
- The leading national journals in the field are ECOLOGICA and IZGRADNJA.
- The topics related to energy efficiency, sustainable development, and sustainable renewal or recycling of selected case studies (mostly urban areas, singular buildings or brownfield locations) are elaborated in various postgraduate or doctoral theses available in academic libraries and listed in online search data bases.

In conclusion, available literature in national language dealing with sustainability and especially resilience of built environment is scarce and disperse, and hence cannot be taken into account as a significant input for programme development. Just oppositely, foreseen project results - newly developed learning material (chapter 3.10.4.) will improve literature availability on national level.

3.10.4. KLABS PROJECT SCOPE

The establishment of Centre for Sustainable and Resilient Environments as well as the purchase of equipment, software and bibliographical units from the Erasmus+ grant will assist in provision of resourses necessary for accrediation and implemenation of subject specialist study programme.

The Centre is foreseen as distinguished space equipped with library, individual working stations for students, computers with different software for simulations and assessments, plotters and printers and the equipment for field work. Its functioning will be regulated by institutional general act. A person from educational staff will be delegated to coordinate the work within the Centre.

The Centre is also the base enabling implementation of virtual mobility courses (chapter 3.12. of the report).

By linking all established centres in WB region into one network, different segments of sustainability and resilience should be covered.

Additionally, there is a whole work package in project application dealing with the development of educational material and including the following activities:

- production of educational material relevant for developed courses with active involvement of all KLABS partners,
- translation of developed material to English language, in order to allow insight to all partners and to start with preparations for publishing,
- publishing of developed educational material – textbooks (after the quality procedures), where coordinating institution is guiding the whole process (including procedures for publisher selection, proofreading, etc.),
- selection of developed educational material to be placed into open resource base of the Centre, and
- development of case studies which will be studied within implemented courses, through the cooperation with non-academic sector.

At least 6 textbooks relevant for programme courses will be prepared, reviewed and published during the project life cycle.

3.11. QUALITY CONTROL

3.11.1. LEGAL CRITERIA

National regulations foresee regular control of programme quality based on systematic self-evaluation and external quality control (including the accreditation).

Internal self-evaluation is done at least every 3 years. It encompasses systematic and regular monitoring of programme implementation and the measures for programme quality improvement in terms of curriculum, teaching staff, students' evaluation, textbooks and literature. The students have significant and active role in programme self-evaluation.

External evaluation of a study programme is done at least every 5 years; it includes, inter alia, the request for accreditation renewal.

3.11.2. INSTITUTIONAL CONDITIONS

Quality control is important segment of the work at the Faculty of Technical Sciences in Kosovska Mitrovica. Separate Faculty body – Commission for Quality Control continuously monitors and controls educational processes at the institution and the quality of institutional work. It also gives recommendations for quality improvement and future development of the Faculty and submits reports to the Educational-Scientific Council of the Faculty, at least once per year.

Every 3 years, the Commission for Quality Control carries out internal self-evaluation of all study programmes at the Faculty.

3.11.3. QUALITY IN KLABS PROJECT

There is a series of activities foreseen in KLABS framework which aim to improve the quality of new specialist study programme, including: internal (consortium level) evaluation of developed programme and its drafts (KLABS Committee for Quality Assurance); students' evaluation of new programme; external evaluation of study programme by independent international experts; internal (consortium level) evaluation of newly developed educational material (KLABS Editorial Committee); and external evaluation of developed educational material by independent international experts.

3.11.4. EUROPEAN FRAMEWORK FOR QUALITY ASSURANCE IN HIGHER EDUCATION

European Association for Quality Assurance in Higher Education has established in 2015 new standards and guidelines for internal and external quality assurance, and for quality assurance agencies.

The following **European standards and guidelines for internal quality assurance** have been established:

- Policy for quality assurance
- Design and approval of programmes
- Student-centred learning, teaching and assessment
- Student admission, progression, recognition and certification
- Teaching staff
- Learning resources and student support
- Information management
- Public information
- On-going monitoring and periodic review of programmes
- Cyclical external quality assurance.

In terms **of external quality assurance**, the following European standards and guidelines have been established:

- Consideration of internal quality assurance
- Designing methodologies fit for purpose
- Implementing processes
- Peer review experts
- Criteria for outcomes
- Reporting
- Complaints and appeals.

3.12. DISTANCE LEARNING SYSTEM

3.12.1. LEGAL CRITERIA

Studies based on distance learning methods and technologies are supported by resources that allow for good quality achievement in programme implementation.

Higher education institution may organise distance learning programme for every educational-scientific area or field, if:

- educational (learning and teaching) content is supported by available resources, allowing for distance learning methodology application,
- the level of acquired knowledge equals to the knowledge acquired by applying common educational methodology,
- the efficiency is equal as in common studying,
- awarded diploma has a value that is equal to diploma issued upon completion of common programme.

The content of a distance learning programme is contemporary, adapted to distance learning methodology, and with defined time necessary for consultations.

Teaching material corresponds to programme objectives, curriculum and syllabi, in terms of quality, content and scope. Distance programme allows for individual successful knowledge mastering.

Learning instructions, provided by a higher education institution, contain specific propositions and suggestions for learning strategy and performance of individual knowledge checks.

The subsystem for knowledge testing is integrated into management system for distance learning process, supporting various forms of learning and knowledge testing (consultations, self-checks, pre-exam tests, reports, exams).

The final exam is taken at institution's seat, i.e. in the premises displayed in institutional work permit.

Teaching staff included in distance learning programme is qualified and competent for foreseen learning methodology. The educators are responsible for development and preparation of teaching material and tests, as well as for synchronisation of all activities related to programme successful mastering.

Maximum 3 distance learning courses in a semester may be assigned to a single professor. The consultations are carried out either with professors or associates. One professor, i.e. one assistant may have consultations mostly with the 80 students in a semester.

Minimum number of permanently employed professors and associates amounts to 70% of minimum number necessary for programme implementation. When a same study programme is organised both in common and distance learning form, total number of professors and assistants is defined by applying common (usual) methodology, where a single professor may have consultations with maximum 80 students (both from common and distance learning programmes) in one semester.

3.12.1.1. Distance learning resources (equipment, library, space)

Higher education institution provides equipment and communication-information technologies for the establishment and maintenance of two-directional communication on relation teacher-student, necessary for the implementation of distance educational activities (part of teaching, consultations, self-checks, pre-exam knowledge tests, projects, seminary works, etc.).

In the management system of distance learning process, an institution provides:

a) one owned or rented integrated computer platform (Distance Learning System – DLS) which contains special software for multimedia teaching resources storage and distribution, and which is intended for individual acquisition of information and overall management of teaching process;
b) different teaching forms, such as: public broadcasting of planned and in advance scheduled educational events (live broadcasting of lectures or discussions captured with a video camera, or broadcasting of previously prepared video material); lectures and multimedia teaching material delivery from the server; and formal and informal consultations through discussion forums;
c) unique user interface that supports various categories of users, including students, teachers and administrative staff;
d) good quality, two-way communication between educators and students through electronic mail, discussion forums and discussions in real time;
e) the possibility for recording the time students spent while studying teaching materials;
f) student checks and assessments by using tests, with the support and under the control of a specialized software package;
g) high reliability of the system with appropriate access control and content protection.

Higher education institution provides access to the own or other appropriate libraries, particularly to the organizations specialized for the delivery of textbooks and other teaching and scientific publications in electronic format.

Higher education institution has spatial and other capacities sufficient to organise standard (physical) final examination, work of the administrative staff, and placement and maintenance of integrated computing platform.

In order to improve the quality of consultations, the institution may set up consultation centres geographically distant from its seat; distant consultation centres have 1. information-communication basis which is integrated into distance learning system, and 2. professional literature. These physical units are also used for provision of practical exercises.

3.12.2. PROJECT SCOPE

KLABS project foresees creation of material conditions and introduction of virtual mobility of students and staff between all participating Western Balkan higher education institutions (including the Faculty of Technical Sciences in Kosovska Mitrovica), as well as the procedures to assess the results and effectiveness of applied mobility method.

3.12.3. MOBILITY, DISTANT LEARNING AND VIRTUAL MOBILITY AT THE FACULTY OF TECHNICAL SCIENCES

Outgoing mobility practice at the Faculty of Technical Sciences in Kosovska Mitrovica is currently modest and hence cannot be considered as a significant form of knowledge gaining at international higher education institutions.

So far, students from the Faculty individually attended international practice organised by the International Association for the Exchange of Students for Technical Experience (IESTE); two groups of students – one from the study programme Architecture and another from the Electrical Engineering, participated in mobility activities within two TEMPUS projects in which the Faculty of Technical Sciences in involved (TEMPUS RESARCH – 530440 and TEMPUS ENERGY – 530379).

Starting from the school year 2015/2016, the Faculty of Technical Sciences participates in ERASMUS+ Credit mobility project coordinated by the Technological University of Lublin (LUT) in Poland. The first group of students are already attending their classes in English at LUT; during the two-year cycle of the project, it is expected that more students from different study programmes, as well as the Faculty staff (both teaching and non-teaching), will benefit from this mobility action.

The Faculty is member of consortia in four submitted applications in the last call for ERASMUS+ Credit mobility grants, and is at the moment waiting for selection results.

The Faculty of Technical Sciences in Kosovska Mitrovica didn't organise distance learning programs to-date. Analogously, virtual mobility practice has not been initiated yet. The realisation of KLABS project objective related to the introduction of students' and staff' virtual mobility in the third year of project implementation (school year 2017/2018), therefore, brings novelty to the whole institution.

4. SURVEY

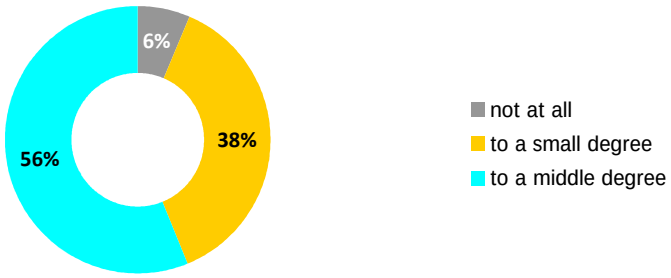
4.1. STUDENTS' SURVEY

32 students of the third, fourth and fifth year of architectural studies at the Faculty of Technical Sciences in Kosovska Mitrovica[10] filled out the questionnaire (Annex 1 of the report) which was previously prepared by the EU partner from the Faculty of Architecture of the University in Ljubljana.

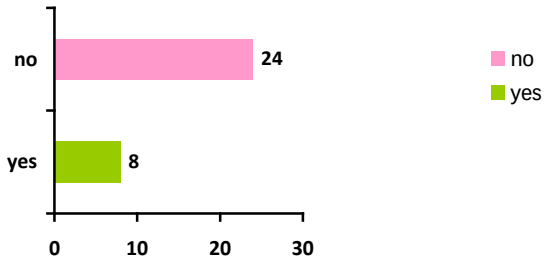
The survey aimed to assess students' knowledge in terms of basic sustainability related issues, additionally familiarity with the meaning of the term "resilient built environment"; to question students' recognition of the importance of sustainability related topics; finally, to examine students' interest for future knowledge upgrade through enrolment to new courses or programmes.

Results of the survey are presented below.

Q1: *How well are you familiar with sustainable design principles?*

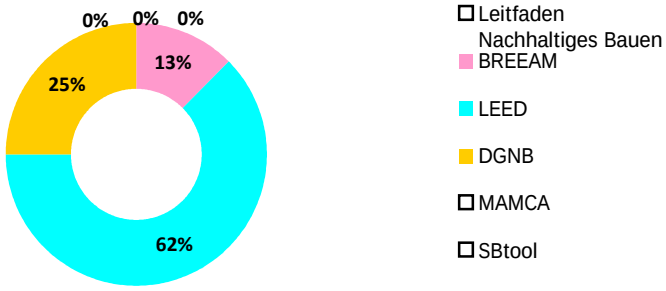


Q2.1: *Are you familiar with any of the sustainable construction guidelines or methods for assessing buildings using sustainable construction guidelines?*

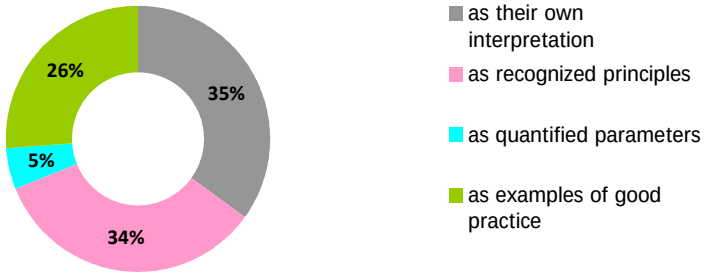


[10] 6 students of the 3rd year, 13 students of the 4th year and 13 students of the 5th year

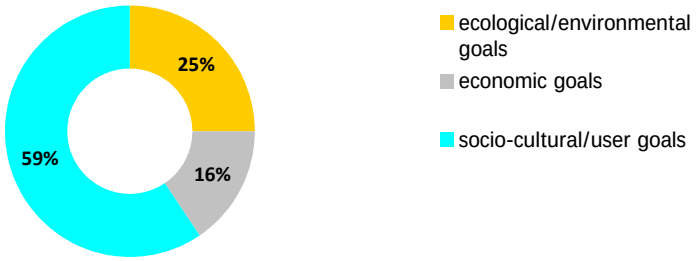
Q2.2: *Which are these sustainable guidelines/assessment methods?*



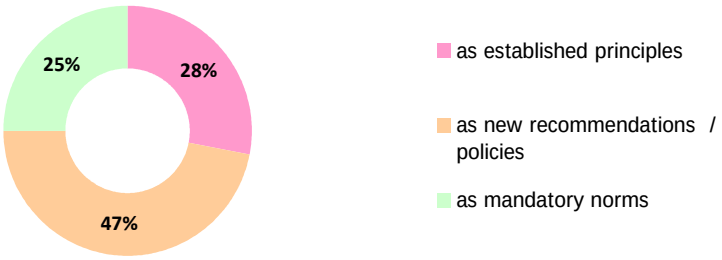
Q3: *In your opinion, how do the teachers get across sustainable design guidelines in their lectures/practicals?*



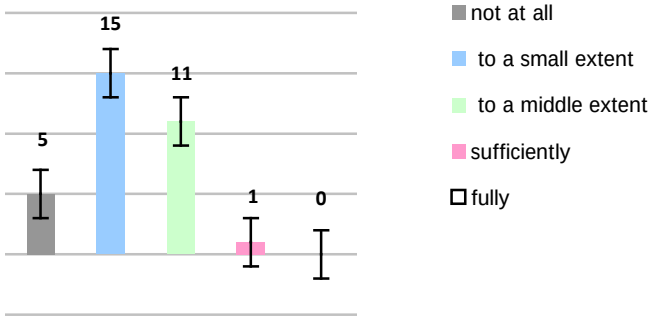
Q4: *In lectures/practicals, which sustainable goals are taught or presented the most often?*



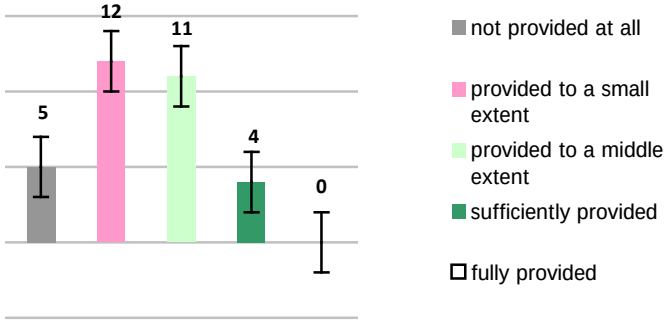
Q5: *How do you, as a student, understand sustainable development guidelines:*



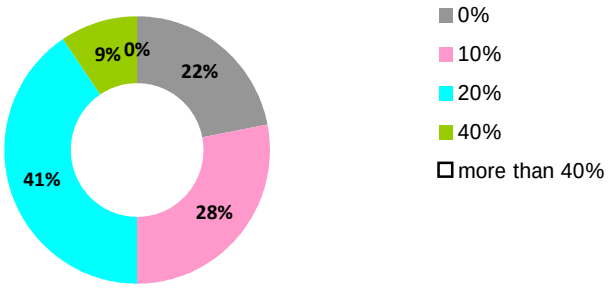
Q6: *Are, in your opinion, sustainable design principles laid down in national legislation in an appropriate form?*



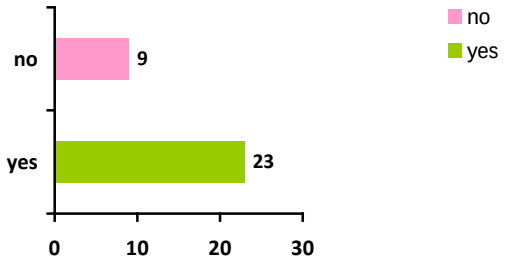
Q7: *Are, in your opinion, sustainable design principles provided to students in teaching process in an appropriate form?*



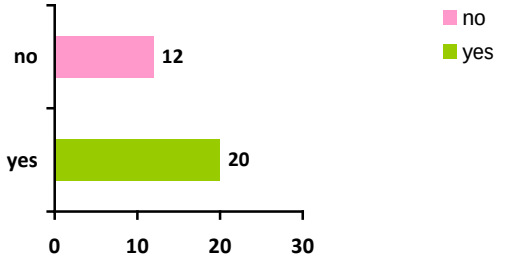
Q8: *What portion of your works (exams, seminar coursework, workshops, etc.) does in your opinion fully comply with sustainable development guidelines?*



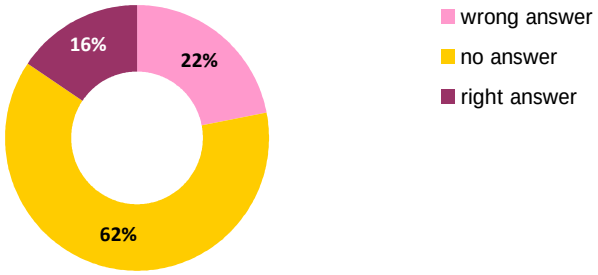
Q9: *If given the opportunity, would you be interested to take an additional course focusing on sustainable development?*



Q10: *If given the opportunity, would you be interested to enrol to new postgraduate study programme focusing on sustainable development?*



Q11: *The term "Resilient built environment" refers to...*



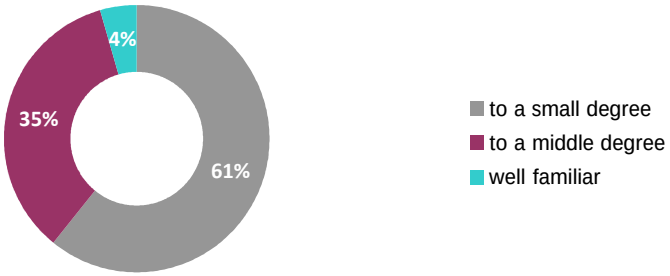
4.2. PROFESSIONALS' SURVEY

23 professionals (12 architects, 4 urban planners and 7 civil engineers) employed as associates at the Faculty of Technical Sciences in Kosovka Mitrovica, officers in the municipalities of Gračanica and Kosovska Mitrovica and practicing engineers filled out the questionnaire (Annex 2 of the report) previously prepared by the EU partner from the Faculty of Architecture of the University in Ljubljana.

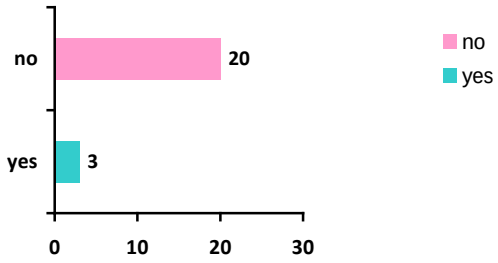
The survey aimed to assess the knowledge in terms of basic sustainability and resilience related issues and to detect the origin of this knowledge, to examine the application of sustainability and resilience principles in professional work, and finally to question the interest for future knowledge upgrade through enrolment to new courses or programmes.

Results of the survey are presented below.

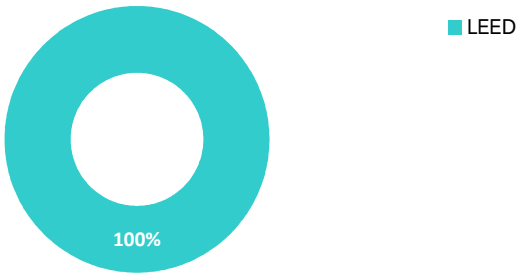
Q1: *How well are you familiar with sustainable design principles?*



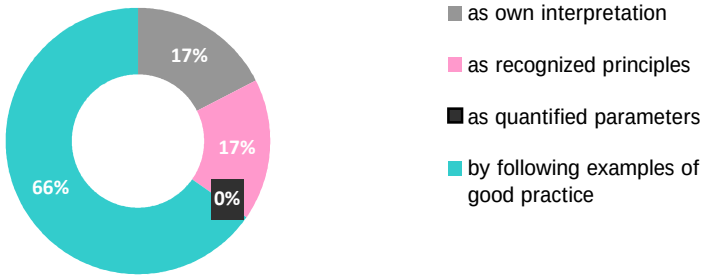
Q2.1: *Are you familiar with any of the sustainable construction guidelines or methods for assessing buildings using sustainable construction guidelines?*



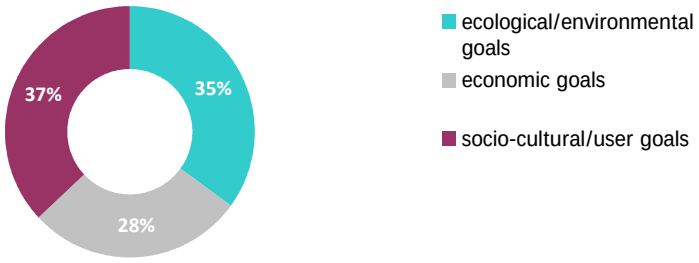
Q2.2: *Which are these sustainable guidelines/assessment methods?*



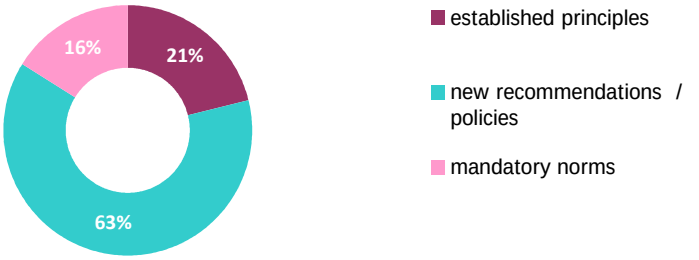
Q3: *How do you, as a professional, incorporate sustainable development policies in your work?*



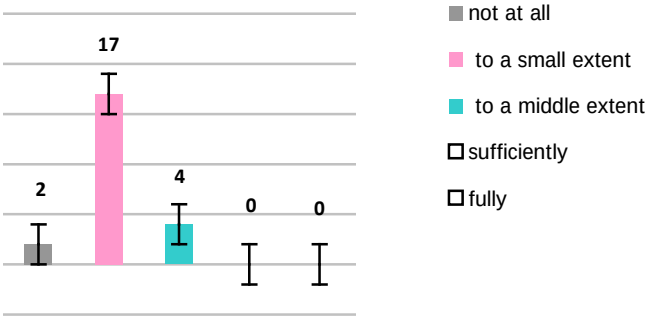
Q4: *Which sustainable development goals are implemented the most in your work?*



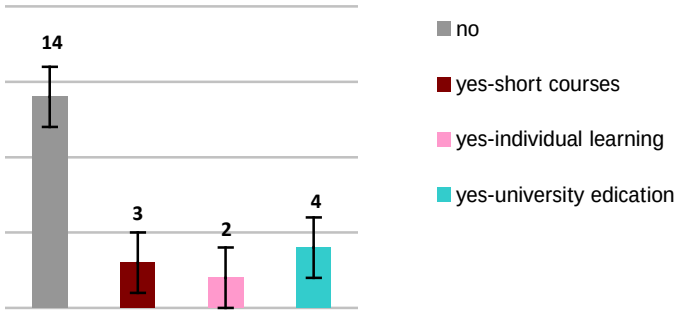
Q5: *In your opinion, sustainable development policies are:*



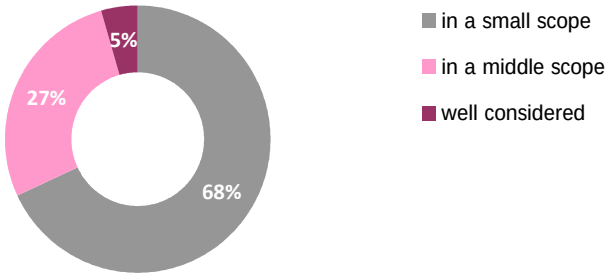
Q6*:* *Are, in your opinion, sustainable design principles laid down in national legislation in an appropriate form?*



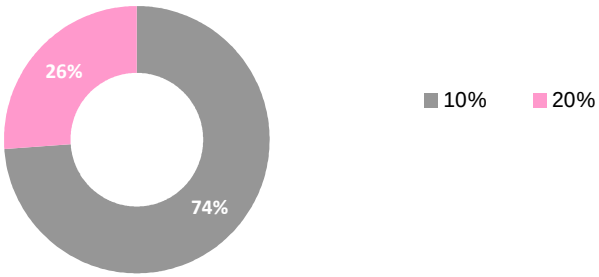
Q7: *Did you acquire during your university education the knowledge about sustainable development principles? If yes, indicate the way in which this knowledge was gained.*



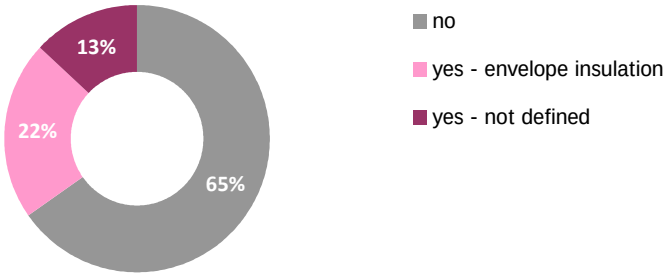
Q8: *Are, in your opinion, sustainable development principles in your work considered in the sufficient scope?*



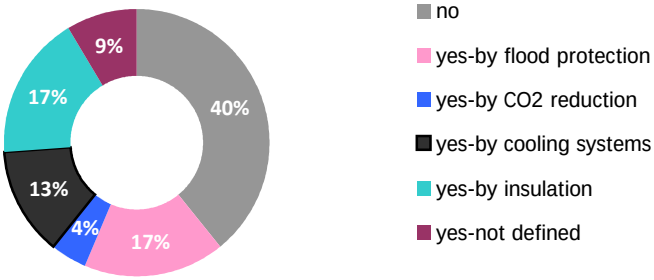
Q9: *What portion of the education does in your opinion fully comply with sustainable development guidelines?*



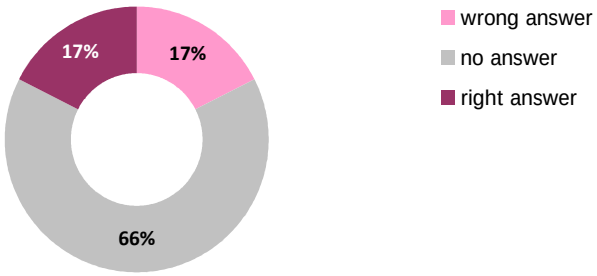
Q10: *In your work, is climate change taken into consideration? If yes, please explain in which way.*



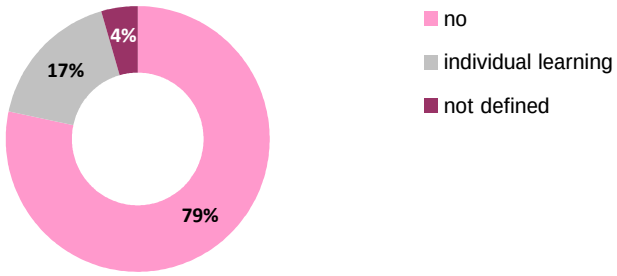
Q11: *Is it, in your opinion, possible to combate climate change through engineering practice ? If yes, please explain in which way.*



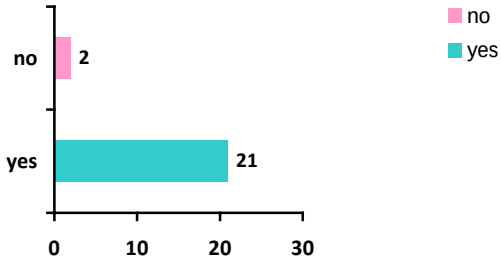
Q12: *In your opinion, the term "Resilient built environment" refers to...*



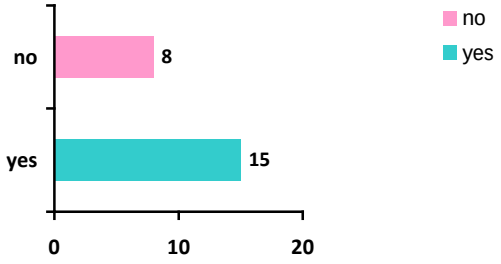
Q13: *Did you acquire during your university education the knowledge about resilience principles? If not, please indicate the way in which this knowledge was gained.*



Q14: *If given the opportunity, would you be interested to take an additional course focusing on sustainability and resilience of built environment?*



Q15: *If given the opportunity, would you be interested to upgrade your education and professional work by enrolling to new postgraduate study programme focusing on sustainability and resilience of built environment?*



5. SUSTAINABILITY AND RESILIENCE IN NATIONAL REGULATIONS AND PRACTICE

During the last decade marked by harmonization of national with EU legal framework, sustainability and sustainable development became integral parts of different national laws and accompanying regulations, standards, strategies, etc., yet the significant part of the fields of sustainability and resilience of built environments remains uncovered by legislation and characterized by rather weak practice.

The most important general legal document referring to sustainability is the Law on Environmental Protection. It regulates stewardship of natural assets and sets general measures and conditions of environmental protection (including planning and construction, spatial and urban planning, strategic environmental assessments, pollution control, emissions, environmental quality control and monitoring, etc.). The measures and conditions of this general law are given in more detail in area-specific laws, such as: Law on Nature Protection; Law of Waters; Law on Forests; Law on Air Protection; Law on Waste Management, etc.

Sustainability links the Law on Environmental Protection with the Law on Planning and Construction. According to the latter, planning, design and utilization of spaces is, inter alia, based on: Sustainable development through integral approach to planning; Balanced spatial development; Rational land use and stirring of the measures for urban and rural renewal and reconstruction; Rational use of nonrenewables and optimal use of renewable resources; Sustainable use of cultural assets, etc. Space planning, design and utilization is, according to the Article 3 of the Law, also based on the principle of prevention of disasters and removal of the causes of climate change; however, this issue is not further elaborated, as legal instruments haven't been adopted yet.

The Law on Planning and Construction further defines 'energy performance of buildings'; energy related issues (including energy efficiency) are in detail defined in two other laws – the Law on Energy and the Law on Rational Energy Use, and two related regulations: the Regulation of Energy Efficiency of Buildings and the Regulation on Energy Certificates, both in force since 2011. The establishment of legal framework in energy domain has enabled the conditions for introduction of training courses on national level, organized by National Chamber of Engineers – the body that is, after successful course completion, issuing licenses to Responsible Engineers for Energy Efficiency of Buildings. To-date, this is the only certificate in domain on sustainability and resilience of built environments that is recognized by the National Employment Service and national legislation.

The Law on Environmental Impact Assessment (2009) introduced the studies with the purpose to predict harmful effects of certain projects on human life and health, wildlife, soil, water, air, climate, landscape, and material and cultural assets, as well as to define and propose the measures by which these effects could be reduced or removed, by taking into consideration projects' feasibility. The Government has brought accompanying Regulation on Assessment Procedure and the List of Projects with Mandatory Assessment Studies; most of the common building types are not on this list, so that the overall environmental assessment of buildings to-date legally remains uncovered field. On the other hand, there are continuous attempts to introduce the application of international building rating systems into

professional practice, mostly by the Green Building Council – the organization which is carrying out both the trainings and the assessments. The number of buildings certified by using these international systems on national level is negligible (less than five). There could be several different causes for present outcome – from economic reasons to the universal (not adapted) character of applied systems.

Legislation in the field of adaptation to climate change has not been brought yet. Currently, resilient engineering practice can be reduced to the work of hardly several enthusiastic and educated individuals. The reasons lie not just in the lack of education, from one, and the lack of legislation from the other side, but as well in overall economic state on national level which lasts for a prolonged period of time, making many existing built structures and cultivated urban/rural areas, due to the non-maintenance, more vulnerable.

6. DISCUSSION AND CONCLUSIONS

The National Strategy of Sustainable Development (2008) foresees new economic system and structure of economic factors, including here educated, adaptable and innovative professionals. Indeed, taking into consideration the nature of the 21 century rapid and often unpredictable changes in the environment, it seems that the education must provide, besides knowledge applicable in different circumstantial contexts, training on social adaptability. The standpoints brought out in Chapter 3.4.2. of the report support this assertion. Education for sustainable development includes not only the implementation of programs on sustainable development in the education system, but as well a system of education that supports knowledge-based economy and is as such necessary precondition for sustainable development of economy and society as a whole (Nacionalna strategija održivog razvoja, 2008).

In a study on national higher education in the context of environmental protection, author Mihajlov (2011) explained several reasons of not recognizing profiles specialized in environmental protection in job market, including: lacking specifications – exact description in profession codebooks; lack of employers' awareness about the skills and competencies of the profession; and a lack of jobs as a result of insufficient economic activity. As a possible systemic solution, the author proposes development of lifelong learning, i.e. adults' educational programmes, accenting on the need to introduce "short" courses in university education offer. In conclusion, Mihajlov highlights necessity to design the market of wanted professions and of knowledge and skills needed to achieve concrete results in sustainable development. Again, the nonexistence of the National Qualification Framework (as given under Chapter 2 of the report) is confirmed as a constraint in new programme development. Similar messages come from the National Employment Service, as well as from the National Strategy for Education, accenting on the lack of synchronisation between the supply and demand.

Although it is clear that the initiative from upper national levels exist, guidelines which could be applied to specific programmes development are still blurred and too general; at the same time, economic constraints represent very important factor contributing to current complex situation. Consequently, the methodology for curriculum development needs to follows bottom up approach, where, additionally, research mix with education, technology mix with curriculum content, and new pedagogical formats, in constant switch from more to less formal, represent in their essence the integral part of knowledge on sustainability and resilience. The criteria and the indicators for new programme development are based on overall need to redirect overall national development towards sustainability and resilience, and then projected to specific contexts and branches.

A. INTERDISCIPLINARY, MULTIDISCIPLINARY AND TRANSDISCIPLINARY RESULTS

Specializing studies Sustainable and Resilient Environments at the Faculty of Technical Sciences in Kosovska Mitrovica, according to the study presented, will combine several disciplines: Architecture (and Urban Planning), Civil Engineering, Electrical Engineering, Environmental Protection Engineering and

Technological Engineering, with the aim to create synthesising, innovative and interdisciplinary curriculum, thereby complying with the National Strategy of Sustainable Development that foresees application of the concept of interdisciplinary education for sustainable development.

The new curriculum is intended for several professions, therefore students enrolling to the new studies compose a multidisciplinary group. The aim is to make use of several different disciplines at once; collaboration and knowledge exchange in educational process will have invaluable significance. Educational methodology must be developed in a way to enable this inter-students knowledge exchange, for example by organising team work. By exchanging experience as well as by gaining new knowledge at the studies, the aim is to produce experts where each of them has expanded input single-disciplinary knowledge and skills to output knowledge and skills for holistic, transdisciplinary approaches to solving of problems related to the achievement of sustainable and resilient built environments, beyond the boundaries of the main educational profile.

Due to the nature of the studies, educators at the developed study programme represent transdisciplinary team consisted of different disciplines (architects, civil engineers, electrical engineers, environmental protection engineers, engineers of technology) working together on the same issues reflected through curriculum content.

B. STUDENTS' INCOMING PROFILE AND STUDY AREAS: INITIAL PROGRAMME CONTOUR

row	Potential study area	Potential incoming profiles					Remark
		Architecture Urban planning	Civil Engineering	Electrical Engineering	Environmental Protection	Technological Engineering	
1	**Environmental pollution and protection basics**	Compatible	Compatible	Compatible	Not necessary	Not necessary	***Necessary to introduce modules*** *Common base*
2	**Sustainability, climate change and resilience basics**	Compatible	Compatible	Compatible	Compatible	Compatible	*Common base*
3	**Socio-cultural discourse in the context of sustainability and resilience**	Compatible	Compatible	Compatible	Compatible	Compatible	*Common base*
4	**Sustainable architecture**	Compatible for those who graduated before 2020	Compatible	Conditionally compatible	Compatible	Compatible	CANCEL - *Necessary to rearrange content rows 5 and 6)*
5	**5.1. Energy and buildings** **5.2. Energy and the built environment**	Compatible	5.1. Compatible for those who graduated before 2020 5.2. Compatible	Compatible	Partially compatible	Partially compatible	Further content development: energy efficiency, certification, energy systems in buildings, renewables in situ, thermography, energy and technology, energy flows, energy grids, decentralised systems, etc.
6	**Green building systems**	For those graduated before 2020	Compatible	Conditionally compatible	Conditionally compatible	Conditionally compatible	CANCEL - *Necessary to rearrange content (rows 7-11)*
7	**Intelligent systems**	Compatible	Compatible	Compatible	Conditionally compatible	Partially compatible	For EP, possible through bionics, reflection to natural systems, etc.
8	**Water use, recycling and reuse in buildings and spaces**	Compatible	Compatible	Not relevant	Compatible / team work	Compatible	*Theory + practice*
9	**Innovative design / technologies**	Compatible	Compatible	Compatible / team work	Compatible / team work	Compatible / products / team work	Development of new spatial forms, products, technologies, etc. Integration of both principles: sustainability + resilience Passive vs. Active *Practical work*

10	**Materials**	Compatible	Compatible	Conditionally compatible	Compatible (mass flows)	Compatible (production, mass flows)	Integration: sustainability + resilience
11	**Structures and skins**	Compatible	Compatible	Not relevant	Not relevant	Not relevant	Integration: sustainability + resilience
12	**Refurbishments**	Compatible	Compatible	Compatible	Compatible	Compatible	*Needed content adjustment*
13	**Urban and rural ecology and ecosystems**	Compatible	Compatible	Not a priority	Compatible	Compatible	Including studies of urban and rural bio systems
14	**Land use**	Compatible	Compatible	Not relevant	Compatible	Not relevant	Integration: sustainability + resilience
15	**Water in sustainable and resilient urban and rural environments**	Compatible	Compatible	Not relevant	Compatible	Compatible	*Possible link with study area No 8*
16	**Integrated urban grids/infrastructure**	Compatible	Compatible	Partially compatible	Compatible	Compatible	Integration: sustainability + resilience
17	**Greening strategies**	Compatible	Compatible	Not relevant	Compatible	Compatible	Integration: sustainability + resilience
18	**LCA studies: selected cases**	Compatible for: Materials Structures Environments	Compatible for: Materials Structures	Compatible for: Energy LCA	Compatible	Compatible for: Materials Products Specific areas	*Possible to split in few courses*
19	**Innovative integrated planning and design**	Compatible	Compatible	Compatible	Compatible	Compatible	*Through practical work in multidisciplinary team*
20	**Management for sustainable and resilient development**	Compatible	Compatible	Compatible	Compatible	Compatible	*Through collaborative team work*
21	**Advanced topics**	Compatible	Compatible	Compatible	Compatible	Compatible	*Through collaborative team work*
22	**RESEARCH METHODOLOGIES**	Compatible	Compatible	Compatible	Compatible	Compatible	Probability and statistics, surveys, mapping, GIS, case studies, SWAT, vulnerability risk assessment, modelling, simulations, etc... *Possible splitting according to the incoming profile*
23	**PRACTICE**	Compatible	Compatible	Compatible	Compatible	Compatible	Individually based *Mandatory?*
24	**FINAL WORK**	Compatible	Compatible	Compatible	Compatible	Compatible	Common base *Optional but commonly present*

C. FINAL REMARKS

The results presented in the above given table represent starting proposal - outline for the development of new interdisciplinary curriculum at the Faculty of Technical Sciences in Kosovska Mitrovica, treating sustainable and resilient built environments. The proposal is derived from several sources:

- project application, with the special reference to project aim and objectives,
- accreditation standards for specialist studies,
- conditions existing at the Faculty of Technical Sciences in Kosovska Mitrovica, with special reference to staff capacity, and existing study programmes at bachelor and master level and their content,
- national conditions in terms of regulations, practice and education,
- European and national studies and guidelines,
- results of the survey carried out among students and working professional engineers,
- 18 separate studies of good examples of postgraduate programmes implemented throughout the European education space, prepared by Programme Countries KLABS partners, and
- authors' experience and expertise in subject education/scientific areas and in university pedagogies.

In forthcoming months and project activities, the Faculty team shall, with the support from European project partners and through experience exchange with Partner Countries partners, have the task to profoundly review this proposal and further reshape it. In this process, it will be necessary to analyse if and to what extent proposed study areas correspond to each potential incoming engineering profile. It will be of greatest importance to, while offering knowledge upgrade, allow for preservation of the basic profession and hence increase chances for the employment or advancement in career. For each study group, the competencies must be clear and useful to the future work and possible continuation of education. The purpose of new study programme, yet to be developed, is not to provide prequalification; on contrary, it should offer highly specialised knowledge and skills in the frames of basic profession. Whether in further elaboration of this proposal a significant collision between the incoming profiles and their inter harmonisation appear, the advice is to drop one of the study target groups. Before this would be done, it is necessary to attempt to bridge this gap by introducing modules and adequate educational methodologies.

Only when the content of new programme is fully developed, it will be possible to define its correct title as well as the title of specialists completing it. For the purpose of harmonization of new programme with the European standards, it will be necessary to examine and compare with national regulations the enrolment practice, duration of studies, final exam conditions, applied educational pedagogies and other relevant issues. Enrolment conditions for the specialist study programme of Sustainable and Resilient Built Environments will be defined after the first programme draft and definition of the profile of the students entering studies. Due to the major lack of literature published in national language, one of the preconditions for enrolment to new programme should be sufficient level of knowledge of foreign languages.

There is enough reason to set the backbone of new programme on architecture and partially on civil engineering. These two disciplines, and especially architecture, have in any case interdisciplinary nature. Adding to this statement many times proven scientific facts of the impact of built objects and spaces on

the environment in terms of significant share in overall use of natural resources, pollution and many other negative implications, it becomes clear that the major part of human errors now clearly manifested in climate change and overall degradation of living environment cannot be corrected without joint efforts of various engineering disciplines, each acting within the own field of expertise, still each having a profound understanding of problem complexity and hence possible solutions.

Despite numerous economic constraints which doubtlessly impact job opportunities, the only possible way in current complex circumstances to contribute to the overall state improvement is to follow bottom up approach.

Students enrolling to the Faculty of Technical Sciences (to different study programmes) come from several different regions, and this practise occurs every school year. It is expected that new postgraduate curriculum Sustainable and Resilient Environments will attract students and working professionals regionally, taking into account that such programmes to-date don't exist as well as programme's quality and originality set by KLABS project.

7. REFERENCES

AKREDITACIJA I SPOLJAŠNJA PROVERA KVALITETA U VISOKOM OBRAZOVANJU, Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije, Beograd, 2013.

Anguillari, E., REVIEW OF EU STUDY PROGRAMMES ON SUSTAINABLE AND RESILIENT ENVIRONMENTS: GOOD CASE EXAMPLES PRESENTATION, WP1.2 Report of the Erasmus+ project KLABS, February – March 2016

Application of the Erasmus+ CBHE project Crating the Network of Knowledge Labs for Sustainable and Resilient Enviorments – KLABS, Section: DETAILED PROJECT DESCRIPTION

Bojan Komnenović, Predrag Lažetić i Martina Vukasović, NACIONALNI OKVIR KVALIFIKACIJA, Centar za obrazovne politike, Beograd, 2010.
http://www.erisee.org/sites/default/files/National%20qualifications%20framework%202010%20SR.pdf

De Haan, G., THE DEVELOPMENT OF ESD-RELATED COMPETENCIES IN SUPPORTIVE INSTITUTIONAL FRAMEWORKS, Int Rev Educ 56(2), 2010, pp. 315–328.

Dokumentacija za akreditaciju studijskog programa: INŽENJERSTVO ZAŠTITE ŽIVOTNE SREDINE, specijalističke akademske studije. Fakultet tehničkih nauka, Novi Sad, 2013. http://www.ftn.uns.ac.rs/724878106/

Dokumentacija za akreditaciju studijskog programa: ENERGETSKA EFIKASNOST U ZGRADARSTVU, specijalističke akademske studije. Fakultet tehničkih nauka, Novi Sad, 2013. http://www.ftn.uns.ac.rs/n272979657/

Europsko udruženje za osiguravanje kvalitete u visokom obrazovanju (European Association for Quality Assurance in Higher Education – ENQA), STANDARDI I SMJERNICE ZA OSIGURAVANJE KVALITETE NA EUROPSKOM PROSTORU VISOKOG OBRAZOVANJA (ESG), Brussels, 2015,
http://www.enqa.eu/indirme/esg/ESG%20in%20Croatian_by%20ASHE.pdf (Croatian), http://www.enqa.eu/wp-content/uploads/2015/11/ESG_2015.pdf (English)

Fikfak, A., COMPARABLE STUDY PROGRAMS for KLABS, WP1.2 Report of the Erasmus+ project KLABS, February – March 2016

Hildebrand, L., Bach, R., REVIEW OF EU STUDY PROGRAMMES ON SUSTAINABLE AND RESILIENT ENVIRONMENTS: GOOD CASE EXAMPLES PRESENTATION, WP1.2 Report of the Erasmus+ project KLABS, March – April 2016

Klein, T., Konstantinou, T., REVIEW OF EU STUDY PROGRAMMES ON SUSTAINABLE AND RESILIENT ENVIRONMENTS: GOOD CASE EXAMPLES PRESENTATION, WP1.2 Report of the Erasmus+ project KLABS, March – April 2016

KOOPERATIVNI ONLAJN BIBLIOGRAFSKI SISTEM I SERVISI, http://www.vbs.rs/cobiss/

Mihajlov, Anđelka, ZNANJA POTREBNA ZA ZELENE POSLOVE I ZELENU EKONOMIJU – ANALIZA IZ PERSPEKTIVE INTEGRALNE ŽIVOTNE SREDINE, U: Pavlović, Vukašin, UNIVERZITET I ODRŽIVI RAZVOJ, Fakultet političkih nauka Univerziteta u Beogradu i Centar za ekološku politiku i održivi razvoj, Beograd, 2011, str.87-98.

Murga-Menoyo, M.A., LEARNING FOR A SUSTAINABLE ECONOMY: TEACHING OF GREEN COMPETENCIES IN THE UNIVERSITY, Sustainability 6, 2014, pp. 2974-2992.

NACIONALNA STRATEGIJA ODRŽIVOG RAZVOJA (The National Strategy on Sustainable Development), "Sl. glasnik RS", br. 57/2008

Peter van den Besselaar and Gaston Heimeriks, DISCIPLINARY, MULTIDISCIPLINARY, INTERDISCIPLINARY – CONCEPTS AND INDICATORS, Paper of the 8th Conference on Scientometrics and Informetrics, Sydney, Australia, July 16-20, 2001, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.569.4199&rep=rep1&type=pdf

PRAVILNIK O LISTI STRUČNIH, AKADEMSKIH I NAUČNIH NAZIVA, „Službeni glasnik RS", br. 30/2007, 112/2008, 72/2009, 81/2010, 39/2011, 54/2011 and 44/2013, http://www.mpn.gov.rs/wp-content/uploads/2015/08/Правилник-о-Листи-стручних-академских-и-научних-назива.pdf

Specijalističke akademske studije: ENERGETSKA EFIKASNOST, ODRŽAVANJE I PROCENA VREDNOSTI OBJEKATA U VISOKOGRADNJI (EES). Građevinski fakultet, Beograd, http://www.grf.bg.ac.rs/studije/mo?mid=21&sem=1

Specialist study programme: ENERGY EFFICIENT AND GREEEN ARCHITECTURE. Faculty of Architecture, Beograde, http://www.arh.bg.ac.rs/en/study-programmes/

STRATEGIJA RAZVOJA OBRAZOVANJA U SRBIJI DO 2020. GODINE, „Sl. glasnik RS", br. 107/2012, http://www.vtsnis.edu.rs/StrategijaObrazovanja.pdf

Studijski programi: OSNOVNE I MASTER STUDIJE ARHITEKTURE, Akreditaciona dokumentacija, Fakultet tehničkih nauka u Kosovskoj Mitrovici, 2014.

Studijski programi: OSNOVNE I MASTER STUDIJE GRAĐEVINSKOG INŽENJERSTVA, Akreditaciona dokumentacija, Fakultet tehničkih nauka u Kosovskoj Mitrovici, 2014.

Studijski programi: OSNOVNE I MASTER STUDIJE ELEKTROTEHNIČKOG I RAČUNARSKOG INŽENJERSTVA, Akreditaciona dokumentacija, Fakultet tehničkih nauka u Kosovskoj Mitrovici, 2014.

Studijski programi: OSNOVNE I MASTER STUDIJE INŽENJERSTVA ZAŠTITE ŽIVOTNE SREDINE I ZAŠTITE NA RADU, Akreditaciona dokumentacija, Fakultet tehničkih nauka u Kosovskoj Mitrovici, 2014.

Studijski programi: OSNOVNE I MASTER STUDIJE TEHNOLOŠKOG INŽENJERSTVA, Akreditaciona dokumentacija, Fakultet tehničkih nauka u Kosovskoj Mitrovici, 2014.

Suau, C., COMPARABLE STUDY PROGRAMS for KLABS, WP1.2 Report of the Erasmus+ project KLABS, February 2016

Wiek, A., Withycombe, L. and Redman, L.C., KEY COMPETENCES IN SUSTAINABILITY: A REFERENCE FRAMEWORK FOR ACADEMIC PROGRAM DEVELOPMENT, Sustain Sci, 6, 2011, pp. 203-218

ZAKON O PLANIRANJU I IZGRADNJI (The Law on Planning and Construction) "Sl. glasnik RS", br. 72/2009, 81/2009 - ispr., 64/2010 - odluka US, 24/2011, 121/2012, 42/2013 - odluka US, 50/2013 - odluka US, 98/2013 - odluka US, 132/2014 i 145/2014, http://www.paragraf.rs/propisi/zakon_o_planiranju_i_izgradnji.html

ZAKON O PROCENI UTICAJA NA ŽIVOTNU SREDINU (The Law on Environmental Impact Assessment), "Sl. glasnik RS", br. 135/2004 i 36/2009, http://www.paragraf.rs/propisi/zakon_o_proceni_uticaja_na_zivotnu_sredinu.html

ZAKON O VISOKOM OBRAZOVANJU (The Law on Higher Education), „Službeni glasnik RS", br. 76/2005, 100/2007, 97/2008, 44/2010, 93/2012, 89/2013, 45/2015 i 68/2015, http://www.svos.org.rs/pdfs/zakon-vo-preciscen-2015.pdf

ZAKON O ZAŠTITI ŽIVOTNE SREDINE (The Law on Environmental Protection), "Sl. glasnik RS", br. 135/2004, 36/2009, 36/2009 - dr. zakon, 72/2009 - dr. zakon, 43/2011 - odluka US i 14/2016, http://www.paragraf.rs/propisi/zakon_o_zastiti_zivotne_sredine.html

ANNEX 1

SURVEY – implementation of sustainable planning principles in the teaching process

Abbreviations: SD = sustainable design (planning), RES = renewable energy sources

▸ **I'm a student of** (circle): 1st 2nd 3rd 4th 5th Year

---

1. How well are you familiar with sustainable design (SD) principles? (circle): (1 = not at all, 5 = extremely well)

1 2 3 4 5

2. Are you familiar with any of the sustainable construction guidelines or methods for assessing buildings using sustainable construction guidelines indicated below? (If Yes, please circle to what extent, 1 = not at all, 5 = extremely well)

- Leitfaden Nachhaltiges Bauen/Sustainable Construction Guidelines	YES 1 2 3 4 5	NO
- BREEAM	YES 1 2 3 4 5	NO
- LEED	YES 1 2 3 4 5	NO
- DGNB	YES 1 2 3 4 5	NO
- MAMCA	YES 1 2 3 4 5	NO
- SBtool	YES 1 2 3 4 5	NO

3. In your opinion, how do the teachers get across SD guidelines in their lectures/practicals? (1 = least often, 5 = most often)

– as their own interpretation of "sustainability" and/or as their own experience	1 2 3 4 5
– as widely recognized principles for designing "user- and environment-friendly" buildings	1 2 3 4 5
– as formal, quantifiable parameters (RES, CO2, etc.)	1 2 3 4 5
– by providing examples of good practice	1 2 3 4 5

4. In lectures/practicals, which SD goals are taught or presented the most often and which ones the least?

A - ecological/environmental goals (protection of natural resources/ecosystem)

- low emissions throughout the life cycle of a building	1 2 3 4 5
- low energy use throughout the life cycle of a building	1 2 3 4 5
- use of environmentally friendly materials	1 2 3 4 5

B - economic goals

- project/building price	1 2 3 4 5
- low maintenance costs	1 2 3 4 5
- low operating costs	1 2 3 4 5

C - socio-cultural/user goals

- security, health, pleasure (natural lighting, ventilation, temperature, etc.) 1 2 3 4 5
- functionality 1 2 3 4 5
- design and urban design qualities 1 2 3 4 5

5. How do you, as a student, understand SD guidelines (circle one):
Mostly as:
- already established, widely recognised contemporary design principles □
- newly introduced recommendations and/or policies by the mentor/teacher in individual courses □
- as mandatory norms (e.g. for promoting the energy performance of buildings) □

6. Are, in your opinion, SD principles laid down in national legislation in an appropriate form?
(1= not at all, 5 = fully) 1 2 3 4 5

7. Are, in your opinion, SD principles provided to students in teaching process in an appropriate form?
(1= not provided, 5 = fully provided) 1 2 3 4 5

8. What portion of your works (exams, seminar coursework, workshops, etc.) does in your opinion fully comply with SD guidelines (circle):

0% 10% 20% 40% 50% 60% 80% 100%

9. If given the opportunity, would you be interested to take an additional course focusing on SD?
YES NO

10. If given the opportunity, would you be interested to enrol to new postgraduate study programme focusing on SD?
YES NO

11. In your opinion, the term "Resilient built enviroment", refers to

_____
_____
_____

ADDITIONAL COMMENTS:

_____
_____
_____

Your name (optional):

_____

ANNEX 2

SURVEY – implementation of the principles of sustainability and resilience

Abbreviations: SD = sustainable design (planning), RES = renewable energy sources

▸ **I am** (please circle): 1. Seminar and course coordinator 2. Course coordinator 3. Other (assistant, technical assistant, etc.)

▸ **My profile – professional orientation** (please circle):
1. Architect 2. Urban planner 3. Planner – development planner 4. Civil engineer 5. Researcher – theorist

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1. How well are you familiar with sustainable design (SD) principles? (circle: (1 = not at all, 5 = extremely well)

1 2 3 4 5

2. Are you familiar with any of the sustainable construction guidelines or methods for assessing buildings using sustainable construction guidelines indicated below? (If Yes, please circle to what extent, 1 = not at all, 5 = extremely well)

- Leitfaden Nachhaltiges Bauen/Sustainable Construction Guidelines	YES	1 2 3 4 5	NO
- BREEAM	YES	1 2 3 4 5	NO
- LEED	YES	1 2 3 4 5	NO
- DGNB	YES	1 2 3 4 5	NO
- MAMCA	YES	1 2 3 4 5	NO
- SBtool	YES	1 2 3 4 5	NO

3. How do you, as a teacher/professional, incorporate SD policies in your work? (1 = least often, 5 = most often)

– as your own interpretation of "sustainability" and/or as your own experience	1 2 3 4 5
– as widely recognized principles for designing "user- and environment-friendly" buildings	1 2 3 4 5
– as formal and quantifiable parameters (RES, CO2, etc.)	1 2 3 4 5
– by following the examples of good practice	1 2 3 4 5

4. Which SD goals are implemented the most and which ones the least in your work?

A - ecological/environmental goals (protection of natural resources/ecosystem)

- low emissions throughout the life cycle of a building	1 2 3 4 5
- low energy use throughout the life cycle of a building	1 2 3 4 5
- use of environmentally friendly materials	1 2 3 4 5

B - economic goals

- project/building price	1 2 3 4 5
- low maintenance costs	1 2 3 4 5
- low operating expenses	1 2 3 4 5

C - socio-cultural/user goals

- security, health, pleasure (natural lighting, ventilation, temperature, etc.)	1 2 3 4 5
- functionality	1 2 3 4 5

- design and urban planning qualities 1 2 3 4 5

5. In your opinion, SD policies are (circle one):
- already established, widely recognised contemporary design principles □
- newly introduced recommendations and/or policies by the mentor/teacher in individual courses □
- as mandatory norms (e.g. for promoting the energy performance of buildings) □

6. Are, in your opinion, SD principles laid down in national legislation in an appropriate form?
(1= not at all, 5 = fully) 1 2 3 4 5

7. Did you acquire during your university education the knowledge about SD principles? If not, please indicate the way in which this knowledge was gained.

YES NO

_____

8. Are, in your opinion, SD principles in your work considered in the sufficient scope?
(1= not considered at all, 5 = fully considered) 1 2 3 4 5

9. What portion of the education (seminar coursework, workshops, degree papers, etc.) does in your opinion fully comply with SD guidelines (circle): 0% 10% 20% 40% 50% 60% 80% 100%

10. In your work, is climate change taken into consideration? If yes, please explain in which way.

YES NO

_____

11. Is it, in your opinion, possible to combate climate change through engineering practice ? If yes, please explain in which way.

YES NO

_____

12. In your opinion, the term "Resilient built environment", refers to

_____

13. Did you acquire during your university education the knowledge about resilience principles? If not, please indicate the way in which this knowledge was gained.

YES NO

_____

14. If given the opportunity, would you be interested to take an additional course focusing on sustainability and resilience of built environment?

YES NO

15. If given the opportunity, would you be interested to upgrade your education and professional work by enroling to new postgraduate study programme focusing on sustainability and resilience of built environment?

YES NO

COMMENTS:_____
Your name (optional):_____