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REPORT

on the examination of learning modules and massive open online courses received within the
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"Enhancing competence in sustainable waste management in Russian and Kazakh HEIs"

for compliance with the standards of the Republic of Kazakhstan

and recommendations for their further use

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General Provisions.

The project "Enhancing competence in sustainable waste management in Russian and Kazakh HEIs" is aimed at training personnel in the framework of training for bachelor's and master's programs in sustainable waste management in partner countries (Russian Federation and Kazakhstan). As a result of the work, Massive Open Online Courses (MOOCs) and training modules in the field of waste management in Russian and Kazakh universities were presented, which considered the practical experience and developments of partner universities representing the European Union. The innovative feature of the presented material was the synergistic effect of modern IT technologies with didactic techniques used in the study of environmental, biological, technological, and economic disciplines in the context of a competency-based approach.

The structure of the presented training modules.

The developers of the training modules and massive open online courses were leading teachers and scientists from the Republic of Kazakhstan and the Russian Federation: Al-Farabi Kazakh National University, Sh. Ualikhanov Kokshetau University, M. Auezov South Kazakhstan University, Tyumen State University, St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO) and Ural Federal University. Table 1 presents 8 developed modules, including 20 online courses. The module is 3 ECTS credits.

Table 1 - The structure of modules and disciplines

No	Module name	Course name	Developer
1	Comprehensive risk assessment in waste management	Introduction to environmental risks	Sh. Ualikhanov Kokshetau University
		Environmental, social and economic risks	Tyumen State University
		Solid wastes and environmental risks	
2	Biotechnologies for waste utilization	Basics of ecological biotechnologies	M. Auezov South Kazakhstan University
		The Applied Aspects of Using Biotechnological Methods for Waste Utilization	St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO)
3	Non-energy technologies for waste utilization	Basics of waste utilization	Al-Farabi Kazakh National University
		Reuse of side products and outputs	
		Physico-chemical treatment methods in waste management	
4	Energy technologies for waste utilization	Waste-to-energy plants and technologies	Al-Farabi Kazakh National University
		Energy efficient technologies in waste treatment	
5	Development of business and entrepreneurship for	Modeling of business processes in the field of waste management	St. Petersburg National Research University of Information Technologies,

	sustainable waste management	Business planning for sustainable waste management projects	Mechanics and Optics (ITMO)
6	Public administration and municipal governance in Sustainable Waste Management	Institutional approach to SWM decision-making	Ural Federal University
		Public and municipal governance in SWM	
		Budget and financial base of SWM	
7	Environmental management and waste prevention	Waste prevention: sustainable business models, tools and good practices	St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO)
		Application of ISO 14001 for waste prevention	
		Theory and practice of waste management in companies	
8	Life cycle assessment and life cycle costing	Introduction to LCA based on ISO 14040 series	Tyumen State University
		Application of LCA for waste prevention	St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO)

Expert assessment of the presented modules

The purpose of the examination was to verify the compliance of the submitted modules with the State Compulsory Standard of Higher and Postgraduate Education of the Republic of Kazakhstan and their harmonization with the standards for quality assurance of higher education in the European space (ESG). At the same time, the possibility of subsequent accreditation at the national / international levels of the educational program was considered, in which the developed modules or their components could be included. Attention was drawn to the possibility of harmonizing the presented material with the models of the formation of

educational programs (EP) implemented in the universities of the Republic of Kazakhstan and the Russian Federation. As a result, the following conclusions were made:

1. The developed modules generally comply with the quality assurance policy of the universities of the Republic of Kazakhstan and the Russian Federation, which is presented on the information portals of higher educational institutions. The presented modules incorporate the concept of gender, ethnic, religious and social equality. With the further integration of the modules into the educational process, the possibility of their development is traced in interaction with internal and external stakeholders, which allows us to hope for the successful implementation of the obtained material in the educational process.

2. When developing modules and online courses, professional standards for the profile are considered, which determines a direct relationship with the professional community. This is clearly manifested in the analysis of materials forming modules: "Biotechnologies for waste utilization", "Non-energy technologies for waste utilization", "Energy technologies for waste utilization", "Public administration and municipal governance in Sustainable Waste Management".

3. The proposed modules assume that students have the opportunity to form an individual educational trajectory. At the same time, according to such presented modules as "Comprehensive risk assessment in waste management", "Environmental management and waste prevention" and the course "Basics of ecological biotechnologies", it is possible to obtain professional practical skills directly at the production sites themselves (including in the summer, during professional practices, etc.), which today is a competitive advantage for obtaining professional competencies.

4. For the successful integration of the developed modules and massive open online courses into existing (or developing) EP, it is necessary to have a qualified teaching staff with appropriate basic education and / or additional professional education in the proposed academic disciplines.

5. Information support, the exchange of information between participants in the educational process on the proposed modules presupposes the presence of certain digital - competencies and skills. Unfortunately, this information was not explicitly presented in the descriptive part of the modules and online courses. Obviously, her presence contributed to a more complete understanding of the implementation of the presented modules and recommendations for conducting classes online.

6. A positive moment is the fact of informing the public about the project activities related to the developed modules. The online courses created by the consortium members were tested on the following platforms:

- National Platform for Open Education of Kazakhstan- <http://moocs.kz/>
- Open online courses- <http://open.kaznu.kz/>
- ITMO courses - Open online training - <https://open.ifmo.ru/>

Main conclusions

I. The developed educational modules are relevant and correspond to modern trends in environmental education, environmental management in the field of waste prevention and sequestration, entrepreneurial activities in the field of sustainable waste management, technologies for processing and disposal of waste products, etc.

II. The material presented in the training modules suggests that they are student-centered, in which the teacher and students are active subjects of the educational process. This allows you to create for each student conditions conducive to effective advancement along the chosen educational trajectory, self-realization of each student, as well as the professional growth of teachers.

III. The presented modules presume the involvement of stakeholders in the work to determine the influence of individual disciplines on the formation of learning outcomes.

IV. The strong point of the modules presented is their autonomy, which makes it possible to recommend them for inclusion in educational programs of related profiles.

V. The proposed modules correspond to the State Compulsory Standard of Higher and Postgraduate Education of the Republic of Kazakhstan, are harmonized with the standards for quality assurance of higher education in the European space (ESG) and can be introduced into the educational process in Kazakhstani universities.

External evaluator: Professor Kosov Vladimir, expert of the 1st category of the Independent Agency for Accreditation and Rating (Kazakhstan)