Needs Assessment within the framework of the Erasmus+ project "Human Development for the Central Asian Water Sector to increase resilience to climate change and support sustainable development, peace and security"
HWCA:

I. Number of students/teaching staff

1. Thematic profiles of water programs

A. Educational programs at the undergraduate level:

At the university, personnel are trained in 40 educational programs at the bachelor's level (including 11 educational programs in the field of water management):

60112400	Professional education: Land cadastre and land management
60112400	Professional education: Agricultural mechanization
60230100	Philology and Language Teaching: English
60310100	Economics (water sector option)
60410100	Accounting and auditing (by industry)
60410800	Statistics (by industry and area)
60420100	Jurisprudence: transboundary water relations
60420100	Jurisprudence: land relations
60530800	Hydrology (hydrology of rivers and reservoirs)
60531000	Mechanics and mathematical modeling
60610600	Software Engineering
60610700	Artificial intelligence
60710400	Ecology and environmental protection (water sector option)
60710600	Electric power industry (by industry and directions)
60710800	Hydropower industry
60711000	Alternative energy sources (by type)
60711300	Metrology, standardization and product quality management (by industry)
60711400	Automation and control of technological processes and production (by industry)
60711500	Mechatronics and Robotics
60720600	Materials science and technologies of new materials (by industry)
60722600	Geodesy and geoinformatics
60722700	Innovative technologies in remote sensing of the Land Cadastre (by type of activity)
60722800	Technical expertise and marketing of machinery and technologies (by type)
60722900	Hydrotechnical construction (by type)
60730900	Agricultural Mechanization
60810100	Technical service in agriculture and water management
60810300	Innovative machinery and technologies in agriculture
60810400	Technology of storage and primary processing of agricultural products (by type of product)
60811300	Water sector and land reclamation
60812300	Mechanization of water management and land reclamation works
60812500	Operation of hydraulic structures and pumping stations
60812600	Reclamation hydrogeology
60812900	Water Supply Systems Engineering
60813000	Innovative technologies in the water sector
60813100	Land cadastre and land management
61010400	Tourism (by field of activity)
61020200	Occupational health and safety (by industry)

60713300	Aerospace technologies and sustainable development (by type of activity)

Б. Educational programs at the graduate level:

36 educational programs at the master's level (including 13 specialties in the water sector) are offered at the university:

70111202	Engineering graphics and design theory.
70310102	Economics (water sector option)
70310109	Bioeconomics
70410101	Accounting (by industry and area).
70411302	Business Management (Master of Business Administration — MBA)
70530804	Hydraulics and engineering hydrology.
70710201	Biotechnology (by product type)
70710401	Environmental protection (agriculture and water sector option)
70710401	Environmental protection (geoinformation systems)
70710406	Waste management.
70710601	Electricity supply (in the water sector)
70710704	Electrotechnological processes and devices (by industry).
70710801	Hydropower industry Energy saving and energy audit (by industry)
70710901	Hydropower industry Energy saving and energy audit (by industry)
70711001	Alternative energy sources (by type)
70711401	Automation of production and technological processes (water sector option),
70722601	Geodesy and geoinformatics.
70722702	Aerospace technologies and sustainable development (by industry and sector)
70730901	Hydraulic engineering structures (water sector option)
70730904	Organization and technology of the construction of hydraulic structures
70810101	Agricultural Mechanization
70810502	Smart measuring systems and devices in the water sector
70810601	Land management
70812302	Land reclamation and irrigated agriculture
70812304	Engineering systems and structures for rural water supply
70812306	Water-saving irrigation technologies
70812307	Water resources planning and management
70812401	Mechanization of hydro-reclamation works
70812501	Operation of hydraulic structures, their reliability and safety
70812502	Operation and diagnostics of pumping stations and devices
71020201	Occupational safety, safety of production and technological processes (by industry)

В. Scientific specialties in which PhD and DSc programs are implemented:

1. 01.02.04 - Mechanics of a deformable solid
2. 05.01.01 - Engineering geometry and computer graphics.
3. 05.01.02 - System analysis, management and information processing

4. 05.01.03 - Theoretical foundations of computer science
5. 05.01.11 - Digital technologies and artificial intelligence
6. 05.01.06 - Elements of computer technology and control systems
7. 05.01.08 - Automation and control of technological processes and productions
8. 05.05.07 - Electrical technologies and electrical equipment in agriculture
9. 05.07.01 - Agricultural and reclamation machines. Mechanization of agriculture and land reclamation
10. 05.09.06 - Hydraulic engineering and reclamation construction
11. 05.09.07 - Hydraulics and engineering hydrology
12. 06.01.02 - Land reclamation and irrigated agriculture
13. 06.01.10 - Land management, cadastre and land monitoring
15. 08.00.04 - Agricultural economics
18. 11.00.05 - Environmental protection and rational use of natural resources
19. 11.00.07 - Geoinformation
22. 05.05.06 - Energy devices based on renewable energy
23. 05.10.01 - Охрана труда
24. 05.09.04 – Water supply. Sewage system. Water protection building systems

2. The number of undergraduate, graduate, and postgraduate students enrolled in these programs:

A. Number of undergraduate students:

The total number of full-time students in all four courses is 6080 (including 2030 water education programs), 6006 by correspondence (including 2,121 water education programs)

Б. Number of students in Master's degree programs:

The total number of students this year is 147 (but usually the number was about 480, which decreased due to the new requirements for applicants to the master's degree in foreign language proficiency at least B2)

B. Number of PhD and DSc students:

At the moment, the number of basic doctoral students (PhD applicants) is 136, doctoral students, DSc applicants -12.

3. Number and thematic profile of the teaching staff (full professors, associate professors, assistants, teachers)

Total number of teaching staff / including in the direction of water management	Working full time	Part-time	Scientific. potential (main staff), %	Scientific potential (considering those who in part-time), %

	Total in the main staff	Doct.Sciences, Prof.	Candidate of Sciences, PhD, Associate	Without a degree	Total on part-time	Doct.Sciences, Prof.	Candidate of Sciences, PhD, Associate	Without a degree		
642/219	**480/ 163**	**67/ 23**	**214/ 73**	**203/ 69**	**162/ 56**	**39/ 13**	**77/ 26**	**46/ 16**	**57,7**	**61,2**

To ensure the integration of education, science, and production, the University adheres to a policy of filling 15-20% of general professional and graduate department staff with leading production specialists and scientists from scientific organizations. Thus, industry and science representatives work part-time at each department and participate in its educational and scientific activities.

4. Availability of teaching opportunities in economics, finance, institutional, and political disciplines for undergraduate and graduate students

The curricula of educational programs, including in water management areas, provide for the teaching of university required courses and elective subjects, which also include economics (such as Water Economics, Management), finance (such fundamentals of entrepreneurship, taxation taxes), institutional (national and international water relations), political sciences (political science). These disciplines are taught by the teaching staff of the Departments of Economics, Humanities and Accounting and Auditing.

5. List of teachers who are able to give lectures in English

The university employs 30 teachers in various departments (except the departments of Foreign Languages and English Philology) with experience working on international projects or with education received abroad, who can lecture in English in several disciplines. Of these, 8 people come from water management disciplines. In addition, every year, from 40 to 50 (for example, in the 2023-2024 academic year, there were 47) teachers from leading foreign universities were enrolled in the relevant departments, and they participated in the educational and scientific activities of the university in both online and offline modes.

6. Estimated percentage of students able to study subjects in English or use literature in English

English as the language of education is just beginning (especially in the last two years, when knowledge of a foreign language has become one of the requirements for admission to the master's degree) and is gaining more and more momentum. To date, it is gaining more and more momentum. The estimated proportion of students

who can study subjects in English or use textbooks in English at the undergraduate level in various educational programs varies from 5 to 60%. This indicator differs from 35% to 70% at the Master's degree level.

II. Description of training programs

7. Brief description of Bachelor's degree programs in water resources management (subjects, modules, language of instruction, etc.)

The curricula of all Bachelor's degree programs have the same structure, including blocks of "Humanities and natural sciences," "General Professional disciplines," and "Special disciplines." The curricula include compulsory subjects and elective subjects (up to 30% of the total allocated 240 credits), which allow the creation of opportunities for learning additional professions, considering the interests of students and personal customers. Subjects, modules, and language of instruction vary in Bachelor's degree programs in water resources management, depending on their planned educational goals. For example, in the curriculum of the Bachelor's degree program 60812300 - "Water Management and land Reclamation", 30 ECTS credits are allocated for the module of humanities (foreign language, modern history of Uzbekistan, Uzbek (Russian) language, philosophy, physical education and sports, psychology, etc.). These modules are completed in the first, second, and fifth semesters, considering the program of subjects, the prerogative, and the logical sequence of educational materials. The modules of the cycle of natural science disciplines in a professionally oriented form ensure the purposeful assimilation of these modules. The main task of the modules on the subjects of the natural science cycle is to familiarize the future Bachelor's specialist with the basics of mathematics, physics, and other sciences corresponding to the specialties to promote better assimilation of individual components in the future to improve the possibilities of solving problems that arise in the work. The modules of natural sciences are studied in the first, second, and fifth semesters in the amount of 23 ECTS, taking into account the prerogatives of the curriculum in the subjects. Modules of general professional disciplines, including compulsory and elective subjects, occupy a relatively large part of the academic curriculum. The modules of this cycle consist of logically sequentially arranged disciplines such as engineering geodesy, theoretical mechanics, Information Technology, soil science and Crop Production, Geology and Hydrogeology, GIS, Resistance of Materials, Hydraulics, Hydrology, Hydraulic Engineering, etc. 106 ECTS credits were awarded to subjects in this cycle. Modules of general professional disciplines are studied in the second, third, fourth, fifth, and sixth semesters (see the curriculum, appendix). Modules of general professional disciplines create the basis for students to master specialized disciplines. Modules in specialized subjects such as Irrigation and Land Reclamation, Integrated Use of water resources, Operation and maintenance of hydro-reclamation systems, etc., are studied in the sixth, seventh, and eighth

semesters. 81 ECTS credits are allocated in these subjects (see the curriculum in the appendix), taking into account the prerogatives of the curricula and the logical arrangement of subjects in the curriculum. Modules of specialized disciplines also consist of compulsory subjects and elective subjects. The subject cycle of specialization is important for forming a specialist and achieving planned learning goals. The university's education is organized in Uzbek (60-70%), Russian (15-20%) and English (10-15%). Bachelor's degree programs also include four types of practice during the study period: 1. Introductory and educational practice. Introductory and educational internships are organized after the first year of study at the university and related organizations under the guidance of a teacher. Students will be introduced to the relevant production organizations and their work for six weeks, divided into several selected organizations. 2. Educational practice. After the second year of study, an educational internship is organized in university laboratories and selected modern organizations. Students carry out laboratory and technological work for 4-6 weeks under the guidance of a mentor teacher and strengthen their knowledge in selected subjects. 3. Qualification practice. The qualification internship is scheduled for six weeks after the third year of study. During the qualification internship, students are assigned to various selected modern organizations in the field of specialty. During the qualification internships, students work under the guidance of leading experts from organizations and perform professional duties. After completing the qualifying internship, students receive credits and grades from the organization. 4. Pre-graduate industrial practice. The pre-graduate internship is scheduled for ten weeks in the second semester of the fourth year of study. Students will work and collect the necessary materials for their thesis in selected organizations. This practice allows students to study modern production technologies and analyze and work on their approaches to develop measures and recommendations. For example, after the first year of study, students of the Bachelor's degree program 60812300- "Water Management and Land Reclamation" go on an internship for two weeks in Engineering geodesy and for two weeks in soil science. After the second year of study, students go on an academic internship, where they master the applied part of the theoretical knowledge gained in the classroom. After the third year, students complete qualifying internships at specific and modern organizations and enterprises, such as regional irrigation system management authorities, irrigation service companies, Ministry of Water Resources Departments, and others. Students work as assistants to specialists, doing the same work as full-time employees of the organization. Basic skills such as calculating water resources, planning the use of water resources, operating and maintaining irrigation and reclamation systems and structures, and documenting water resources management and use, etc., are acquired during the qualification internship. In the second part of the fourth year, students complete a pre-graduate internship to improve their own skills and collect data for their thesis. In all cases, the head of the university and the organization ensures that the entire process runs smoothly. The

head of the internship from the university visits the internship facilities several times to make sure that the student acquires the skills necessary to obtain an education/specialty. The duration of the Bachelor's degree program is four years, two semesters of 15 weeks each during the academic year (a total of 8 semesters). The total number of ECTS for four years of study is 240, which are distributed for compulsory subjects (65-70%) and elective subjects (25-30%), practices of 18-20 credits, and the final defense of the project or the state exam - 5 credits.

8. Brief description of Master's degree programs in water resources, non-technical subjects (economic, financial, institutional, social, political aspects of water resources management)

The Master's degree programs at the TIIAME National Research University, in accordance with the State Educational Standard of the Republic of Uzbekistan, provide for the study of modules (disciplines) of the following academic cycles: M.1 - Cycle of compulsory disciplines (MD) - 32 ECTS; M.2 - Cycle of elective disciplines (ED) – 18 (ECTS): M.3 - Research Activity (RA) -70 ECTS: - Professional internship (scientific, qualification); -Qualification internship - Research work of a master's student, including the completion of a master's thesis, state certification: registration and defense of a master's thesis The duration of the Master's degree program is two years, two semesters of 20 weeks each academic year (4 semesters in total). The total number of ECTS for two years of study is 120. Undergraduate students complete two internships during their studies: 1. Scientific (research) internship. The Master's degree students' learning process consists of two parts during each week. It includes lectures, practical classes, three-day laboratory classes, and a two-day research internship. Students gain theoretical knowledge and applied skills by studying in classrooms three days a week. They participate and work in research activities and projects under the guidance of appointed mentors with extensive research experience and gain research experience at the university for two days a week. They master various research skills, starting with literature review, defining research goals and objectives, exploring and selecting appropriate research methods, planning and conducting experiments, collecting and processing data, and analyzing and drawing conclusions as research assistants. The academic internship is planned for three semesters and is distributed between the second, third, and fourth semesters with specific assignments and distributed ECTS for each semester. 30 ECTS points are allocated for scientific internships. 2. Qualification internship. The qualification internship is scheduled for five weeks after the first year of study. During the qualification internship, students are assigned to various selected modern organizations, research centers (specialized at the Academy of Sciences of the Republic of Uzbekistan), and international research centers in the field of specialty. During the qualification internship, students work under the guidance of leading experts and researchers from organizations and perform research and educational functions. After completing the qualification internship, students receive credits and

grades from the organization. 8 ECTS points were allocated for the qualification internship. For example, in the curriculum of the Master's degree 70812307 - "Planning and Management of water resources", 32 ECTS points are allocated for the module of compulsory subjects (Research Methodology, Water Treatment, Integrated use and protection of water resources, Water Cadastre and integrated water Resources Management, International and national water Relations, Environmental Expertise, Teaching methods of special subjects). Modules of compulsory subjects are studied in the first, second, and third semesters (see the curriculum in the appendix), considering the subject's prerogatives, learning outcomes, and graduate qualification requirements. 18 ECTS points are allocated for the elective subjects module, which allows students to deepen their specialization and acquire additional knowledge and competencies in specific areas of interest. The module of elective subjects (three alternative subjects are offered for each elective subject) subjects are studied in the first, second, and third semesters, taking into account the prerogatives of the curriculum, learning outcomes, and qualification requirements for graduates. The research activity consists of three parts: 1. Research work and preparation of a master's thesis with 32 ECTS credits completed during the third and fourth semesters; 2. Scientific (research) internship with 30 ECTS credits completed during the first, second, and third semesters; 3. Qualification internship with 32 ECTS credits was completed during the first, second, and third semesters. Students of the Master's program - 70812307 - "Planning and Management of water resources", for example, also complete two internships during the study period. The objectives of the internships include the acquisition by students of practical and research skills in real-world conditions of enterprises, organizations, and institutions (such as the Ministry of Water Resources, the Department of Water Cadastre, the Design Institute of UzGIP, Specialized research institutes, the Department of the Ministry of Ecology, Environmental Protection and Climate Change, Industry research Institutes, and others) and collect data for his Master's thesis. In all cases, a supervisor from a university or organization is appointed to ensure that the entire internship process runs smoothly. The university supervisor visits the internship facilities several times to ensure that the student acquires the skills they need in the field of education/specialty.

9. In which language are textbooks and other teaching materials used at the university (local language, Russian, English, etc)

The university uses textbooks in Uzbek, Russian and English, depending on the language in which the subject is taught..

10. Willingness/opportunity to gradually introduce water resources management and water diplomacy subjects into the existing bachelor's and Master's degree curricula.

The introduction and improvement of educational and scientific programs related to water resources management and water diplomacy, including at the bachelor's, master's, and doctoral levels, are among the priority areas of development and are included in the strategic development plan of the university for the near and medium term (until 2030). Thus, the university is ready and working on this issue. Over the past two years, the University has opened educational programs 60420100-Jurisprudence: Transboundary Water Relations at the bachelor's degree level and Law: Transboundary Water and Land Relations at the Master's degree level with a focus on subjects related to water resources management and water diplomacy.

11. Estimated time and procedure required for the accreditation of new training programs/modules III. Replenishment/exchange opportunities - to improve the ability to teach new academic programs

Following the existing procedure, a higher education institution wishing to open a new educational program must submit all the necessary grounds-documents substantiating (including feedback from potential employers, the need for personnel, analogues abroad, expected educational goals, etc.) the need to open this educational program to the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan. Further, after considering the issue, the Ministry may allocate a quota for admission under this program. Educational programs are officially accredited after the first graduation. The National Research University "TIIIMSH", as a university with academic and financial independence, has every opportunity to open a new one / replenishment/exchange to improve the ability to teach new educational programs.

12. Can your institution hire new staff to teach water resources management and/or issues related to water diplomacy? Will it be possible to do this in the coming years?

Yes, this is an important issue for the TIIAME National Research University. The university's strategic development plan provides for increasing the proportion of international students and teachers to 10% of the main contingent, with the main place occupied by employees teaching water management disciplines. The University annually hires new employees. The Special Working Group on University Recruitment pays special attention to this issue. Job advertisements are given on various platforms: (https://www2.daad.de/ausland/lehren/daadlektoren/de/16886-freie-lektorate-und-dozenturen/?s=1&projektid=57681347&page=1; https://tiiame.uz/en/content/vacancies;)

13. Is the institution interested in inviting guest lecturers? What topics/expertise would be most interesting? Can we cover the cost of accommodation/travel/remuneration, etc.?

Yes. The TIIAME National Research University is interested in inviting guest lecturers. The most interesting topics include, but are not limited to, the following:

-Water Resources Planning and Management,
-Drinking Water Supply and Sanitation Systems Design and Operation,
-Water and Wastewater Treatment,
-Environmental Impact Assessment,
-Water Resources and Environmental Modelling. Application of Modern Models
-Research Methodology. Planning of the experiments
-Water cooperation and diplomacy,
- Food, Energy, Water Nexus
- Environmental Engineering,
-GIS and Data Analyses in Water Resources and Environmental Management
-Academic Writing
-Ground Water Assessment Development.
-Environmental and Resource Economics etc.

The university can accept invited lecturers on a full-time or part-time basis and pay them salaries within the existing staff standards or on an hourly basis to provide a place in the university's guesthouse. However, it is desirable that the guest lecturer teaches the full course of the chosen discipline.

14. The opportunity to invite "practitioners" - government officials, representatives of international and regional organizations, research institutes, etc. - to give lectures. What topics/expertise would be most interesting? Can we provide the cost of accommodation/travel/remuneration, etc.?

To ensure the integration of education, science and production, the university tries to fill up to 15-20% of the graduate staff with leading scientists from scientific organizations and experienced specialists from specialized production organizations. Based on this, the university can invite "practitioners" - government officials, representatives of international and regional organizations, research institutes, etc. - to give lectures. The most interesting subjects include, but are not limited to, the following:

-Water Resources Planning and Management,
-Drinking Water Supply and Sanitation Systems Design and Operation,
-Water and Wastewater Treatment,
-Environmental Impact Assessment,
-Water Resources and Environmental Modelling. Application of Modern Models

-Research Methodology. Planning of experiment
- Food, Energy Water Nexus
- Environmental Engineering,
-GIS and Data Analyses in Water Resources and Environmental Management
-Academic Writing
-Ground Water Assessment Development.
-Environmental and Resource Economics
-Water Diplomacy and Cooperation
- Water conservation technologies
-Enhancing International Cooperation etc.

The university can accept invited lecturers on a full-time or part-time basis and pay them salaries within the existing staff standards or on an hourly basis to provide a place in the university's guesthouse. However, the guest lecturer should teach the full course of the chosen discipline.

15. The problems of implementing academic (external and internal) mobility in the form of joint modules or entire master's degree programs. Faculty willing (able) to participate in teaching, research, regional curriculum coordination, and exchanges

The TIIAME National Research University has a reasonable amount of experience in implementing joint educational programs, including those involving student mobility and teaching staff based on the platform of various projects. The TIIAME National Research University has a reasonable amount of experience in implementing joint educational programs, including those involving student mobility and teaching staff based on the platform of various projects. The University has 11 joint educational programs, including double degree programs at the bachelor's, master's and doctoral levels with universities such as Wageningen (the Netherlands), Obuda (Hungary), Life Sciences (Slovenia), Michigan State University (USA), BNTU (Belarus), KazNIAU (Kazakhstan), Giessen (Germany) and others. An analysis of the survey of previous projects shows several problems related to implementing academic (external and internal) mobility. First, there is a lack of financial resources, followed by issues such as a lack of English proficiency and experience in an international format. Nevertheless, academic (external and internal) mobility in the form of joint modules or entire master's degree programs is exciting and effective. In this regard, the TIIAME National Research University's field of academic (external and internal) mobility in the form of joint modules or entire master's degree programs is exciting and effective. In this regard, the TIIAME National Research University positively views the development of this area. The university has a teaching staff that is willing and able to participate in teaching, research, regional curriculum coordination, and exchanges.

16. A list of teachers willing to actively participate in the modernization of existing curricula or the development of new curricula (in cooperation with EU universities), preferably with a relatively good command of English.

Many people at the university want to participate in the modernization of existing curricula actively or the development of new curricula, among them are those who have worked in previous projects, such as TEMPUS, ERASMUS, COPERNICUS, etc. As an example, we cite the following. Still, their number may be increased over time, taking into account the time and desires of other potential candidates:

1.Prof.Salokhiddinov A.T.
2. Senior Lecturer Mamatov S.A.
3. Prof. Karimov B.K.
4. Prof. Radkevich M.V.
5. Mirzakobilov J.B.
6. Senior Lecturer. Razzakov R.I.
7. Assoc. Gadoev N.

17. List of faculty members willing to join continuing education courses or research projects related to water resources management and/or water diplomacy.

1.Prof.Salokhiddinov A.T.
2. Senior Lecturer Mamatov S.A.
3. Prof. Karimov B.K.
4. Prof. Radkevich M.V.
5. Mirzakobilov J.B.
6. Senior Lecturer. Razzakov R.I.
7. Assoc.Khamidov A.O.
8. Ass.Abdumazhidov E.
9.Adhamov J.

18. The list of teaching staff willing to participate in English language proficiency improvement courses.

1. Prof. Radkevich M. V.
2. Sen. Lec. Mamatov S. A.
3. Prof. Karimov B. K.
4. Ass. B. Nasibov
5. Ass. Mirzakobilov Zh.
6. St. Rev. R. Razzakov.
7. Assoc. Khamidov A. O.
8. Senior lecturer K. Shipilova
9. Ass. P. Khakimova.

10. Ass. E. Abdumazhidov
11. Assoc. M. Muminov.
12. Assoc. Ishzhanov J.

19. Willingness/opportunities to work with university representatives from other Central Asian countries to develop agreed modules (especially on water diplomacy) that can be taught at several universities in the region.

The TIIAME National Research University is ready in principle to work with representatives of universities from other Central Asian countries to develop coordinated modules (especially on water diplomacy) that can be taught at several universities in the region. Moreover, the university is already working in this direction. For example, this semester, 32 students from the Kyzylorda University of Korkit-ota came to the university under the mobility program. Similar programs are being implemented with many other universities, such as MGSU (Russia), KazNIAU (Kazakhstan), etc. At the same time, it should be pointed out that the work's success in this area largely depends on the development of agreed documents and the high-quality implementation of the work provided for in the program. Therefore, the TIIAME National Research University calls for the careful development of agreed modules (especially on water resources management and water diplomacy), taking into account the current global achievements of science and technology in the field and the specific features of the Central Asian region, so that they can be taught at several universities in the region.