REsource for Water, Energy and Nutrients (REWEN)

Number of the network: CZ-0000-00-2526

Academic year: 2025/2026

Long Program Description

1. Justification of the topics undertaken within the proposed network

In the context of ongoing climate change challenges (COM(2015)614), efficient **(waste) water management** which is crucial to build a resilient future for our cities and towns, not only in Europe, but worldwide, and has become one of the Sustainable Development Goals of the UN (Goal 6: Ensure access to clean water and sanitation for all, 2015, and indirectly Goal no: 11, 12, and 13).

The new Circular Economy Action Plan specifies the reuse of wastewater (WW) and sewage sludge management as a part of water management. The principles of the circular economy require to prevent waste production and the resulting waste must be perceived as an integrated plan of nutrient management or a tool to reduce the carbon footprint. The network **"REsource for Water, Energy and Nutrients" (REWEN)** is fully in line with the Roadmap to a Resource Efficient Europe. The **REWEN will create the professional network of experts in the field of water efficiency: waste(water), energy from WW, and nutrients from WW**. T**he transfer of teachers and students** will provide an increase in the quality of teaching, but there will also be a significant transfer of know-how and knowledge sharing among the partners. The network will not only provide for teacher and student mobility, but also for excursions, joint publications and the development of joint double degree programs (Masters and PhD programs).

As current **(waste)water management** is energy demanding and produces many residues or products that are only partially used/recycled, this REWEN aims to advance the water management system towards the circular economy paradigm (EC directive 2014/24) and sustainability as targeted in the European Green Deal, one of the Commission priorities for 2019-24 (EC directive 2019), the EU 2019/1009 revision, and EU Priorities (Building a climate-neutral, green, fair and social Europe). Furthermore, the aim of the Action is to comply with the EU Circular Economy Action Plan, Blue Growth or the bio-economy strategy and the "Farm-to-Fork" strategy, where the main objective is the recovery of nutrients (N, P).

The implementation of management change towards the circular WW management is specified in the framework the EU Action Plan for the Circular Economy (COM/2015/0614 final). Further details are provided in the national current practices and legislation constraints that are specific for each individual country. In terms of biosolid reuse and nutrition potential from the WW treatment; several limits exist, as for instance, restriction

for the use of sewage sludge/biosolids on agricultural soil. It is now known that in addition to heavy metals, organic micropollutants (such as drugs and their residue), personal care products, polyaromatic hydrocarbons (PAHs), perfluoroalkyl substances (PFAS), and microplastics have to be considered.

The legislation constraints must be understood as challenges that open new ways for innovation, such as the case of banning biosolids landfilling or addition of phosphate rock to the list 20 Critical Raw Materials. The commercial opportunity has been introduced by the Directive on the promotion of the use of energy from renewable sources (2009/28/EU). However, modern regulatory principles based on risk assessment, respect the cost sustainability of the application of sewage sludge and nutrients, evaluate the agrochemical availability of phosphorus, etc.

The current revision of the EU Framework Directive on Sewage Sludge (SSD, 86/278/EEC) requires reviewing a number of existing EU directives such as Fertilizing Products Regulation, Waste Framework Directive, Water Framework Directive, Landfill Directive, Nitrates Directive, Renewable Energy Directive, Energy Efficiency Directive, and REACH Regulation.

The REWEN network is an environmentally-friendly sustainable system that includes elements of "circular integrated wastewater treatment plant (WWTP)" for the use of i) waste(water), ii) energy from WW, and iii) nutrients from WW.

i) Reuse of treated wastewater

In the last decades, several states of the EU and other countries have experienced shortage of water which has negative impacts on the environment, society and economy. WW presents a valuable source of water under safe and economically efficient conditions. The reuse of water/WW for agriculture irrigation contributes to recovery of nutrients and substitute for fertilizers. Already in 2013, EU identified WW reuse as an alternative source of water in areas with limited water sources, namely the Mediterranean. In 2015, research and development started on the quality of treated WW and its application in agricultural irrigation, and for replenishing the groundwater resources. Already in the document Closing the Loop: EU action plan for the Circular Economy (2015), EC committed to take several measures to support treated WW reuse, including the legal regulation on minimal requirements for WW reuse. The Water Reuse Regulation (EU, 2020/741) which sets uniform minimum water quality requirements for the safe reuse of treated urban WW in agricultural irrigation, has been applicable since June 2023.

Every year there are more than 40 000 million m^3 of WW treated in the EU, of which 964 million m3 are reused, thus, there is still a potential to reuse six times more WW (Water Reuse Factsheet, 2016). Reusing more than 50% of the total water volume theoretically available for irrigation from WWTPs in EU would avoid more than 5% of direct abstraction

from water bodies and groundwater, resulting in more than 5% reduction of the overall water stress (2018/0169/COD). It is important to note that replacing the direct discharge of treated WW into watercourses with irrigation WW leads to the retention of residual pollution concentrations on agricultural land. As a result, the waste (residual pollution concentration) is directly converted into a useful product (fertiliser).

ii) Energy from wastewater

To achieve a technically feasible and socially desirable sustainable management of growth and resilience, the water and energy nexus is becoming increasingly crucial in the development of innovative solutions. The development of novel strategies to improve the sustainability of WW and resources in modern cities is leading to introduction of new paradigms. WW is no longer seen as a waste stream, but rather as a mining ground to obtain valuable nutrients and energy. In this perspective thermal energy, often neglected today, could be recovered for different purposes. It is necessary to further explore the design and application of energy recovery from WW for heating, drying of biosolids, etc., and cooling by means of exchangers and heat pumps. In addition, a type of WW such as urine can be used as a source of electrical energy.

Sludge management at WWTPs is also another source of energy that could be used for the generation of electricity (co-generation) or cooling (tri-generation). Energy flow in WWTP complexes is important in the case of WW as well as biosolids treatment using the following processes: gasification, mono-incineration, co-incineration, hydrothermal carbonization, hydrolysis, pyrolysis, torrefaction, etc.

Common small-scale WWTPs that use anaerobic digestion are also valuable source of energy as they produce biogas. The use of biogas for heating purposes is also within the scope for reducing greenhouse gases.

iii) Nutrients from biosolids

The strategic management of WW sewage sludge/biosolids (further called biosolids) is an urgent and highly up-to-date issue not only in the EU, but also in other countries. The goal is to maximize the reuse of biosolids as resource in accordance with the Circular Economy Strategy. The SSD (86/278/EEC) was published more than 30 years ago with the aim of encouraging biosolids treatment and restricting the use of biosolids in agriculture to prevent harmful impact on soil, vegetation, animals, and humans. EU countries are allowed to specify the conditions under which untreated biosolids can be used directly. There have been several attempts to review and amend the directive. In 2014, the Directive was evaluated in ex-post evaluation of certain waste stream Directives, Bio Intelligence Service, Final report (2014). The evaluation has shown that the SSD has met the original aims, i.e. increase application of biosolids in agriculture, and reduction of damages in the environment, namely heavy metals. On the other hand, the evaluation has identified many issues where the directive does not reflect the needs and practice in

biosolids management, as the qualitative indicators are unilaterally directed. Since that time, there have been many studies which have confirmed the serious issues about the quality development of biosolids. EC under the pressure of European Parliament has committed to revaluate the SSD due to increasing consumption of pharmaceuticals and their accumulation in biosolids, and consequently in the ground and surface water (Communication on a European Union Strategic Approach to Pharmaceuticals in the Environment (COM (2019) 128) (2020). EC then opened a public discussion to the Roadmap for SSD revision in 2020. In line with the EC's Better Regulation principles, a methodology was published for the final evaluation (SWD (2023) 157) on 22 May 2023.

EC plan is to support the reuse of biosolids in agriculture under safe conditions with regards to the Circular Economy, Green Deal and the Farm-to-fork strategy which emphasizes the nutrients recovery (namely N and P) and carbon capture and storage strategy challenge. Furthermore, the draft focuses on contaminants of emerging concern (e.g., organic chemicals such as pharmaceuticals, PAHs and PFAS, cosmetics, and microplastics), which is a complex task where many stakeholders might conflict in the context and on the potential impact of the Urban Waste Water Treatment Directive (UWWTD; 91/271/EEC) which has been assessed, and published a draft revised directive in October 2022.

The SSD (86/278/EEC) focuses mainly on heavy metals as the potential toxic substances, but industry has managed to reduce their emission and are not the main contaminant in biosolids. Therefore, there is a need to focus on emerging pollutants with severe impact on health need to be evaluated, namely organic and inorganic chemicals, pharmaceuticals, antimicrobial resistance, antibiotic resistance, microplastics, and microbiological analysis considering the regional differences. It is necessary to establish cooperation on where and when biosolids might be applied.

Concept of blue-green infrastructure

Current challenge is the concept of blue-green infrastructure (BGI) which combines a blue and green approach for the use of treated WW (gray water and tertiary treated WW from municipal WWTP) for green roofs, walls, and parking lots. In addition to the use of treated WW for irrigation of green infrastructure, there is an attractive challenge for the use of biochar from various wastes (sewage sludge, wood waste, food waste, etc.) as nutrient carriers, stable carbon, and high specific surface area for water retention in green infrastructure. BGI concept can even lead to a reduction in the temperature of buildings during summer (green roofs and walls) and reduces the energy needs for cooling the buildings, thus, improving the microclimate in cities. This concept will capture rainfall and reduce surface runoff into the sewer, nutrients in biochar (C, K, N, P) will be used in the green infrastructure and the awareness of "waste to product" will be implemented. In the case of green parking lots, traffic pollution (petrol, oil) will be reduced/fixed by filtration/adsorption on the biochar.

The goals of the REWEN network correspond to EU Strategy on Green Infrastructure expressed, among others, in Guidance on a strategic framework for further supporting the deployment of EU-level BGI, where it is stated that Support for the development of BGI can positively contribute to the sustainability of broader EU policies, such as regional development, social cohesion, agriculture, transport, energy production and transmission, disaster risk management, fisheries and maritime policies. BGI brings multiple other social and economic benefits: it provides recreation areas, enhances social cohesion, supports job creation and makes cities, rural and coastal areas more attractive places to live and work in.

The gap in current state of the art

Efficient WW treatment and WW reuse are currently considered worldwide as the most critical element of sustainable water management. Water scarcity that seems to aggravate, drives water management for maximum reuse of treated water. Although reuse is accompanied by a number of benefits, several legislation restrictions limit the access of potential users to the treated WW. Knowledge on the actual effects of WW reuse is currently not consolidated. Also, the products from WWTPs could be more integrated in the BGI, and thus the WWTPs would form a bridge between WW management and BGI. The above-mentioned Commission Guidance, refers to the fact that BGI has an impact on 8 ecosystem functions and services (air purification; climate and radiation regulation; water purification; soil and nutrient cycling; habitat provision; waste decomposition; aesthetic and spiritual; noise pollution control) and six aspects of ecosystem health (air quality; soil structure; energy and material cycling; water quality; habitat and species diversity; ecosystem resilience).

From the general practice, it is known that the legislation on WW reuse for further use differs in EU countries. In a large number of countries, WW and biosolids are taken as waste and it is not legally possible to transform them into a resource - nutrients (organic fertiliser). For example, there are different existing approaches to the treatment of biosolids applied in Denmark and Sweden, the variant application of biosolids according to the size of the WWTP solution in Germany, a complete ban on the application of biosolids is in Switzerland. Other countries are still evaluating their positions and possible changes in their national legislation.

The current trends in biosolids disposal is a shift from waste to products (nutrients), thus, in some countries (e.g., Germany, Austria) thermal treatment via incineration at large and medium-large WWTPs. Incineration (mono- and co-incineration) is generally the most expensive (and the most risky according to the precautionary principle) method of biosolids treatment which can be efficiently applied only at large scale WWTPs. In case of small and medium-small WWTPs (up to 50 000 PE), this method of biosolids treatment is economically inefficient also involving increased transport needs. Moreover, the pollutants in biosolids vary with respect to the pollutants in the WW, generally the

biosolids from smaller community WWTPs contain comparatively less industrial pollutants (e.g., heavy metals, PAHs, polychlorinated biphenyls (PCBs) etc.) and such biosolids under certain conditions would be possible to be used as a resource after treatment (gasification, drying, hydrothermal carbonization, pyrolysis, torrefaction, etc.) in farming, composting, or as an additive to the substrate for green infrastructure (green roofs, walls, parking lots, etc.).

In addition to the embedded chemical energy, which can be recovered through non-oxidative treatment processes, WW itself is also a source of thermal energy which might be used as heat via heat exchangers, heat pumps, or together with the heat for the generation of electricity (co-generation) or cooling (tri-generation). Energy flow in WWTP complexes is important in the case of WW as well as biosolids management, which consumes up to (more than) 50% of operation costs. Therefore, it is necessary to focus on the following technologies and to compare their energy efficiency: i) WW (anaerobic WW treatment as upflow anaerobic sludge blankets (UASB), expanded granular sludge beds (EGSB), aerobic granular reactors (AGS), etc.), ii) sewage sludge (gasification, mono-incineration, co-incineration, hydrothermal carbonization, hydrolysis, pyrolysis, torrefaction, etc.).

In addition to the conventional use of rainwater and recycled gray water, modern technologies enable the preparation of tertiary-treated WW from municipal WWTPs to be of acceptable quality for agriculture or other uses so that the treated WW could be called a “product” with a commercial potential (e.g., to sell the treated WW to farmers). The problematic pollutants in WW are microplastics and organic pollutants (pesticides, drugs, medicine, etc.) that seem to require tertiary treatment via membrane technology (ultrafiltration, nanofiltration, reverse osmosis), advanced oxidation processes (AOPs)/advanced oxidation-reduction processes (AORPs) (ozonation, UV photolysis, hydrodynamic cavitation, sonolysis, photocatalysis, non-thermal plasma, etc.) or cheaper adsorption processes with filtration/adsorption medium (GAC, biochar from organic waste, etc.). The technologies need to be compared and defined regarding their technological, energetic and economical aspects.

In this sense, Life Cycle Assessment (LCA) can be a valid tool. LCA is an analytical tool that captures the overall environmental impact of a product, process or human activity from raw material acquisition, through production and use, on waste management. Therefore, LCA of WW treatment provides a comprehensive framework to quantify the environmental sustainability of WWTPs across various categories. The LCA can help to compare the environmental impacts of different scenarios in which diverse treatment technologies are used, enabling decision-makers to identify the most environmentally friendly options. LCA is deemed useful in the evaluation of WWTP technologies and processes as it gave a clear picture of different categories of environmental concern (i.e. water depletion, greenhouse gas emissions, impact on human health etc.).

2. The main objective of the network

In most countries, it is now a regulatory and environmental priority to find a more efficient technique/way of water treatment and implementation of the circular economy as defined in the EC directive (2014) with the support of Sustainable Development Goals (UN 2015). Current EU action plan for the circular economy (COM/2020/98 final) specifies reuse of WW and biosolids management as part of water management. The principles of the circular economy require the prevention of waste production and the resulting waste must be perceived as an integrated plan of nutrient management or as a tool to reduce the carbon footprint. To enhance the cohesion policy and cooperation of European towns/cities and other regions, it is necessary to define the potential to transform materials from WW into products; and to map and organise the state/regional approaches to the transformation of liquid and solid waste from WWTP into products; and to determine its further application in BGI as well as its transformation into energy across the partner countries participating in this REWEN network.

The main problem of (waste)water management is that there is no comprehensive system that would support the circular economy and sustainability due to legislation concerns at WWTPs. This sustainable system would include elements of "circular integrated WWTP" for the use of biosolids (nutrients), energy and water. The resources obtained could be usable directly at WWTPs, but especially in the vicinity for irrigation of forestry and agricultural land or water use in industry, use of biosolids products as soil improvers in agriculture or BGI, and thermal energy for drying biosolids, heating buildings or generating electricity. The challenge is to combine these elements of the circular economy into model cases of circular integrated WWTPs that will save/reuse nutrients, energy and water. These circular integrated WWTP systems are non-existent or only emerging across the EU as well as the other countries, there are also no legislative restrictions on the management of these renewables, as well as methodologies for charging these resources to WWTP operators/owners.

Consequently, the REWEN network aims at fostering the sharing knowledge through the exchange of teachers and students, discussion and research on how to establish WWTPs as local/regional source points for the reuse of (recovered/treated) biosolids/nutrients, energy and water in the context of BGI infrastructure.

The new REWEN network is also intended to build strong professional institutional and personal relationships among all partners. This is to be achieved through the exchange teachers, master and Ph.D. students. Emphasis is placed on sharing know-how in the field of reuse WW for Water, Energy and Nutrients through tutorials, joint publications, short-term expert excursions and possibly future joint research.

The professional REWEN network will bring long-term collaboration between the involved university partners in Central and Eastern Europe in terms of common

climate, demographic, and sociological challenges. Over the next few years, the network is expected to expand by 1-2 partners per year.

3. Partners institutions and their main roles in the network activities

The REWEN network currently includes 11 partner universities from a total of 8 countries for the academic year 2025/2026:

- Brno University of Technology (the Czech Republic)
- Technical University in Košice (Slovakia)
- Rzeszów University of Technology (Poland)
- BOKU - University of Natural Resources and Life Sciences, Vienna (Austria)
- Budapest University of Technology and Economics (Hungary)
- Slovak University of Technology in Bratislava (Slovakia)
- Czech Technical University in Prague (the Czech Republic)
- University of Banja Luka (Bosnia and Herzegovina)
- Technical University of Moldova (Moldova)
- University of Agriculture in Krakow (Poland)
- University of Prishtina (Kosovo*)

3.1. Brno University of Technology, Faculty of Civil Engineering (the Czech Republic)

Brno University of Technology includes eight faculties. The establishment of this university was in 1849 by the foundation of the Czech-German Technical Institute in Brno, which in 1873 was named the Technical University. The Faculty of Civil Engineering is the largest and oldest faculty at Brno University of Technology. It is the modern tertiary education institution which strives for innovation in the numbers of fields of study it offers, and in the composition and content of individual subjects. Students have access to the latest theoretical and applied findings, and can apply this knowledge in practice. Emphasis is placed on students' academic mobility, particularly within Europe. The Faculty of Civil Engineering offers accredited Bachelor's, Master's and doctoral degree programs as well as lifelong learning courses, and is significantly engaged in research and development activities. In 2014, the construction of the AdMaS Science and Research Center (Advanced Materials, Structures and Technologies) was completed at the area "Pod Palackého vrchem" campus, whose activity significantly influences the direction of research teams at the Faculty of Civil Engineering. The AdMaS Research Center focuses on the development and application of advanced building materials, constructions and technologies in the field of construction, as well as transport systems, infrastructure of cities, municipalities and landscapes.

Main research and study directions of the faculty related to the network subject are:

- study and evaluation of the structure and microstructure of materials and raw materials with the aim of determining the most significant properties necessary for their optimum application in building materials,
- advanced structures and technologies in terms of their improved reliability, durability and economy during their entire life cycle,
- development of BIM technologies,
- testing and development of new wastewater and drinking water treatment technologies,
- energy, ecological and sustainable concepts for the development of urban settlements and regions,
- geodetic, photogrammetric and metrological support for building activities and research,
- development and verification of methodologies for measuring the thermal and microclimatic properties of buildings and parts of structures,
- research into methodologies for the economic analysis of macroeconomic projects.

3.2. Technical University in Košice, Faculty of Civil Engineering (Slovakia)

The Technical University of Košice was founded in 1952, but its roots must be sought much deeper in the past. As early as 1657 the Universitas Cassoviensis was established in Košice, but technical education in Slovakia was only elevated to higher education level in 1762, when the Austro¬ Hungarian monarch Maria Theresa established the Mining Academy in Banská Štiavnica. This provided education and promoted research activity in a group of scientific disciplines ranging from ore mining through to production and processing of metal materials.

The origins of higher technical education in Košice reach back to 1937, when the M.R.Štefánik State Technical College was established in the city. Teaching was supposed to start in the academic year 1938/39, but the pre¬ war events following the Vienna Arbitration caused the college to be moved first to Prešov, then to Martin and finally to Bratislava, where it remained and later formed the basis for the Slovak Technical University in Bratislava.

The true birth of the Košice Technical College came on 8th July 1952, when the Czechoslovak Government issued Directive No.30/1952 Statutes setting up three faculties, namely the Faculties of Heavy Engineering, Mining and Metallurgy. These were joined in 1969 by the Faculty of Electrical Engineering and in 1978 by the Faculty of Civil Engineering.

The important event of the renaming of the College into the Technical University of Košice occurred on 13th February 1991. In 1992 the Faculty of Professional Studies was set up in Prešov, which was transformed in 1996 into today's Faculty of Manufacturing Technologies.

The year 1992 also saw the introduction of the Faculty of Economics, which meant that the University outgrew its original framework of purely technical disciplines, and it continued in this trend in 1998 with the founding of the present¬ day Faculty of Arts.

The Faculty of Aeronautics of the Technical University of Košice was established on 1st January 2005 as a successor of the Air Force Academy of Milan Rastislav Štefánik in Košice, which has been a prestigious educational institution in Europe and in the world providing university education for pilots and air operating personnel for 30 years.

The Faculty of Civil Engineering of the Technical University of Košice was founded in 1977. Over the 47 years, more than 9 000 graduates in all three levels of study have left the gateway to various positions, such as civil engineers and designers, structural engineers, site managers, CEOs, researchers, and teaching staff.

Faculty´s achievements in scientific research and education have been recently ranked us among stable and progressive faculties of the Technical University of Košice, evidenced by the EUR-ACE, international accreditation certificate according to the criteria of the European Accreditation Agencies, which guarantees that the faculty level corresponds to the European technical universities. Nowadays, more than 700 students study at the bachelor, master and doctoral degrees of the study in the fields of civil engineering and environmental engineering.

3.3. Rzeszów University of Technology, Faculty of Civil and Environmental Engineering and Architecture (Poland)

Rzeszów University of Technology is a dynamically developing technical university focused on innovation and scientific progress. The history of the University dates back to 1951, while the Faculty of Civil and Environmental Engineering and Architecture was founded in 1966, and has been carrying out didactic and research tasks since then. Rzeszów University of Technology conducts extensive research in such areas as: material engineering, automation and robotics, construction or environmental engineering, supporting innovative technical and technological solutions. Actively involved in national and international projects. The Faculty of Civil and Environmental Engineering and Architecture has extensive experience in managing research grants. The Faculty employees establish cooperation with local government bodies, as well as cooperation with the industrial sector and business. The Faculty uses the high quality technologies and specialist knowledge to provide reliable, effective solutions to both public and private sector clients. Employees cooperate also with scientific and industrial institutions from abroad, which gives opportunities to conduct mobility among the academic staff,

exchange of experiences and the implementation of research projects. The Faculty offers education at first-cycle full-time studies by bachelor's degree and second-cycle full-time studies by master's degree. The Faculty of Civil and Environmental Engineering and Architecture offers specialized laboratories and access to advanced technologies, which makes the Faculty a great partner in research and development projects. The Faculty conducts scientific research in the field of basic research and applied sciences in the field of technical sciences and specialties that are part of scientific disciplines: architecture and urban planning, land engineering, geodesy and transport, environmental engineering, mining and energy. The main research directions implemented on the Faculty of Civil and Environmental Engineering and Architecture include issues related to: integrated approach to building design in accordance with the principles of sustainable development, research on water treatment technologies and wastewater treatment, developing tools/methods for assessing safety and reliability of water supply systems, developing effective water supply technologies and sewage disposal, alternative water sources, environmental protection, sustainable development and management, risk analyzes in collective water supply systems.

The Department of Water Supply and Sewage Disposal is an organizational unit co-creating The Faculty of Civil and Environmental Engineering and Architecture. The main directions of research conducted in the Department focus on broadly understood water management, including: ensuring reliability and safety of water supply, risk analyzes and risk assessments in the areas of the water supply basin, water resources diversification, water losses analysis, climate change and its impact on the stable of water supply to consumers, hazard assessment and risk management in water systems, failure risk analysis, drinking water quality analysis as a crucial activity ensuring the standards of water consumer safety, water supply under crisis situations, methods of determining the emergency capacity of water supply reservoirs under undesirable events. The Department offer specialized services aimed at enhancing water management systems and ensuring infrastucture reliability. These services include leak detection in pipeline systems by leakmaster noise loggers and Aqua M 300 digital geophone, precise location of critical infrastructure using radio waves technology (SR-24LE Line Locator) as well as development of water safety plans (WSP) for collective water supply systems.

3.4. BOKU - University of Natural Resources and Life Sciences, Vienna, Department of Water, Atmosphere and Environment, Institute of Sanitary Engineering and Water Pollution Control (Austria)

Today's University of Natural Resources and Life Sciences (BOKU) began its success story in 1872 as a small agricultural university under the name "k. k. Hochschule für Bodencultur". Today, the BOKU locations Türkenschanze, Muthgasse and Tulln offer the 15 departments and 11,000 students optimal conditions for learning, teaching and research. At BOKU – University of Natural Resources and Life Sciences, Vienna different

competences of natural sciences, technology and socioeconomics are combined. The 3-pillar principle serves to solve interdisciplinary issues and is the central identification feature of the Bachelor's and Master's programmes. In the Master's programmes, the content of the compulsory and elective modules, based on the entire curriculum (except for the master's thesis), are assigned to the following areas with a minimum share of 15% each: Technology and Engineering, Natural Sciences, Economic and Social Sciences, Law. The University of Natural Resources and Applied Life Sciences is a leading university in the field of interdisciplinary sustainability research in the German-speaking world. It has a manageable size and therefore offers students good faculty support to thrive individually – and it is located in Vienna, one of the most livable cities in the world. As a teaching and educational institution that has committed itself to the sustainable development of society, the university has the responsible task of enabling its students to actively promote sustainable transformation. By imparting sustainability expertise on the one hand and actively promoting sustainability skills on the other hand, BOKU students and graduates are qualified to work in practice in the development of ecologically compatible, economically efficient and socially just solutions. Within the range of courses at the University of Natural Resources and Life Sciences, great attention is paid to imparting the necessary knowledge and promoting skills. In accordance with the BOKU fields of competence in teaching, a large number of topics relevant to sustainability are scientifically processed.

The Institute of Sanitary Engineering and Water Pollution Control - SIG (staff around 30 people) is a member of the Department Water-Atmosphere-Environment - WAU (staff around 150 people) at the BOKU University (Universität für Bodenkultur Wien). It is one of the major Austrian research and educational organisations in the field of urban water management. Emphasising an integrated approach, research includes a wide range of topics as for instance drinking water supply, water pollution control, operation and maintenance of urban water infrastructure, sampling design and water (on-line) monitoring, alternative sanitation concepts and nature-based solution, resource recovery, and digital water. The fields of research are brought together in six areas of competence: (1) infrastructure management, (2) water quality monitoring, (3) water purification and wastewater treatment, (4) stormwater management, (5) resource recovery, and (6) water resources management.

For the current CEEPUS project application “REWEN” competence area number 5 is of central importance. Its background and current research foci are as follows: For decades, wastewater (sewage and stormwater) was considered as waste product that had to be collected, treated and disposed with a high effort and energy use. In recent years, however, a paradigm shift can be observed, which is also supported by the increasing importance of (local) circular economy principles. As a result, wastewater is less seen as waste but rather as resource. Consequently, this field of competence addresses various aspects concerning wastewater as a resource including water reuse and nutrient

recovery, as well as wastewater as a renewable energy source. The Institute's research currently focuses on the reuse of rainwater and greywater, heat recovery from wastewater and sewage sludge management in rural areas.

3.5. Budapest University of Technology and Economics, Department of Sanitary and Environmental Engineering (Hungary)

The Budapest University of Technology and Economics (BME) is a prestigious public research university located in Budapest, Hungary. Established in 1782, it holds the distinction of being the world's oldest institute of technology with university rank and structure. As the leading technological university in Hungary, BME plays a crucial role in advancing engineering education and research, issuing approximately 70% of the country's engineering degrees.

With a robust academic framework comprising more than 110 departments and institutes across eight faculties, the university is home to a vibrant academic community. Over 1,100 lecturers, 400 researchers, and numerous guest experts contribute to its teaching and research endeavors. Hosting over 20,000 students, including an international community of around 7% from 50 different countries, BME offers a truly global learning environment.

The university provides training in five languages—Hungarian, English, German, French, and Russian—making it accessible to a diverse student body. Since 1995, BME has implemented the European Credit Transfer and Accumulation System (ECTS), enabling students to participate in the Erasmus exchange program and earn double degrees through the Top Industrial Managers for Europe network.

The Department of Sanitary and Environmental Engineering is working in the frame of the oldest Faculty, the Civil Engineering Faculty.

The education of civil and environmental engineering students at our department is conducted in a two-tier system, with a strong emphasis on practical and application-oriented engineering knowledge. In addition to teaching foundational courses for the Civil Engineering Faculty and the Environmental Engineering program of the Chemical Engineering Faculty, the department delivers numerous mandatory and specialization courses in the Infrastructure Engineering program. It also manages two specializations: Environmental Engineering and Urban Engineering.

Currently, the department supports 5–6 doctoral students within its PhD training program. Since its establishment, the department has actively participated in international education programs. Several of our courses are offered in English within the BSc program, and we regularly welcome exchange students through programs such as Erasmus Mundus MSc. Beyond English-language education, the department is also involved in various international research exchange programs.

Main Research and Study Areas:

- water utilities,
- water and wastewater treatment technologies,
- water quality and environmental issues,
- impacts of climate change,
- development of decision support systems for addressing water quality and water management challenges.

3.6. Slovak University of Technology in Bratislava, Faculty of Civil Engineering (Slovakia)

The Slovak University of Technology in Bratislava (STU) is a modern research and higher education institution. It continues the legacy of the 260-year-old Mining Academy in Banská Štiavnica, where the foundations of vocational and practical learning were established. STU offers education in technical fields and involves students in research in natural sciences, computer sciences, construction, architecture, materials technologies, chemistry and food technologies. STU was founded in Košice and authorised by the Act No. 170/1937 Coll. of the Czechoslovak National Council, on June 25, 1937 as the Technical University of M. R. Štefánik. In July 1939 the Technical University of M. R. Štefánik has been renamed to the Slovak Technical University and it has been moved to its present seat - to Bratislava.

The Faculty of Civil Engineering was founded in 1938 as the first faculty of the STU. It was originally located in both Košice and Martin. The launching of its first departments laid the foundations not only for the present Faculty, but also for technical education in Slovakia. Instructions were given by three departments: the Department of Building Construction and Transportation, the Department of Water and Cultural Engineering and the Department of Surveying. The Faculty presently consists of 19 departments, Institute for Forensic Engineering, a Computing Centre and a Learning Centre. More than 441 employees make up the Faculty's staff, which consists of 34 professors, 66 associate professors, 81 teaching assistants and 66 research assistants. Currently enrolled at the Faculty are approximately 2,300 undergraduate and 150 Ph.D. students.

The Faculty of Civil Engineering offers 8 accredited Bachelor’s degree study programmes, 10 Master’s degree study programmes and 8 Doctoral degree study programmes.

Main research and study directions of the Faculty is targeted at environmental issues, power engineering, advanced structures and technologies, and infrastructure. The Department of Sanitary and Environmental engineering are focusing on the following fields related to the subject of the proposed project:

- energy, environmental and sustainable concepts for the development of urban settlements,

- mathematical and experimental modelling and simulation,
- water supply and wastewater structure and management,
- drinking water and wastewater treatment,
- wastewater and rainwater reuse and recycling,
- energy and other resources recovery from wastewater and waste,
- waste management,
- pollution prevention and environmental monitoring and analyses of selected problems in the fields of environmental engineering.

3.7. Czech Technical University in Prague, Faculty of Civil Engineering (the Czech Republic)

Czech Technical University in Prague is one of the oldest technical universities in the world with a 300-year tradition of outstanding achievements and academic reputation. According to the QS ranking, it belongs among the top 420 universities in the world. It is the top technical university in the CEE region.

Through the data and statistics presented here, it presents the development of data on key indicators (quality indicators, excellence) and thematic overviews of activities in the areas of education, research and the impact of the academic institution on society.

CTU considers data transparency as a communication channel that reflects its identity, development and dynamics.

CTU consists of 8 faculties and 6 university institutes. Of the more than 17 000 students, approximately 15% are from abroad. The greatest interest is in studying at the faculties of civil engineering, electrical engineering, mechanical engineering, information technology, and also architecture. The university institutes focus on specialised research and offer follow-up specific study programmes. A diverse range of quality study programmes and an increasing degree of internationalisation enrich the academic environment and promote global communication and cooperation

The Faculty of Civil Engineering at CTU boasts a rich history and tradition dating back to the 18th century. It offers a wide range of study programmes focused on civil engineering, architecture, geodesy and cartography. It has modern laboratories and technologies that allow students to apply and test theoretical knowledge. Scientific research activities are carried out in cooperation with Czech and foreign partners. Students of the Faculty of Civil Engineering have a wide range of opportunities to engage in professional practice and project work in cooperation with leading construction companies, as well as to participate in exchange stays and international projects. Thanks to their professional preparedness and innovative thinking, graduates are well prepared for the real job market, where they are highly valued in the long term.

3.8. University of Banja Luka, Faculty of Agriculture (Bosnia and Herzegovina)

University of Banja Luka (UNIBL) is the leading higher education institution in the Republic of Srpska and between the leading such institutions in the Bosnia and Herzegovina. The University established on 7 November 1975, it now consists of the following organizational units, i.e. 18 members, of which 16 faculties: Faculty of Agriculture, Faculty of Architecture, Civil Engineering and Geodesy, Faculty of Economics, Faculty of Electrical Engineering, Faculty of Forestry, Faculty of Law, Faculty of Mechanical Engineering, Faculty of Medicine, Faculty of Mine Engineering, Faculty of Natural Sciences and Mathematics , Faculty of Philology, Faculty of Philosophy, Faculty of Political Science, Faculty of Physical Education and Sport, Faculty of Security Science, Faculty of Technology, one Academy of Arts and one Institute of Genetic Resources. As of 2007, the University of Banja Luka has functioned as an integrated university. The University is governed by the Steering Board, the Senate and the rector Radoslav Gajanin, Professor at the Faculty of Medicine.

Human and Material Resources: 811 professors and teaching assistants with full-time employment, 170 professors with outside employment, 168 visiting professors from abroad, 121 associates to carry out clinical practice, 559 administrative workers.

Four student pavilions and 1,600 beds, 16,000 m2 classroom space, 10,000 m2 laboratory space, 20 computer rooms, 200,000 books as well as the reading rooms, student clinic, sports hall and fields, student clubs.

Teaching is conducted according to the Bologna principle: three-level model (4+1+3) and (3+2+3), 15,000 students, 65 programmes of the first cycles of studies, 66 programmes of the second cycle and 15 study programmes of the third cycle of studies. Till now: 42,000 Graduates of the first cycle, 2,600 Master's of Science, 808 Doctors of Science.

International Cooperation: more than 200 bilateral agreements with HEIs from all over the world, international educational projects, Erasmus+ (90 KA1 ICM and 16 KA2 CBHE), CEEPUS programme, TEMPUS (89 projects), Erasmus Mundus (6 projects) and within it the: mobility, membership in networks, cooperation with embassies, foreign governments and different institutions (scholarships, study visits).

Science and Research: 8 active Horizon projects, digital repository of scientific works of the University of Banja Luka, HR logo, participation in book and education fairs, membership in the European Open Science Cloud Network, regular membership of the Open AIRE LE European Research Network, constant progress on the Webometrics Ranking list, constant increase in the number and quality of scientific works in natural sciences, engineering and technology, medical and health sciences, agricultural sciences, as well as social sciences and humanities.

Entrepreneurship and Technology Transfer Centre: Projects of the Centre; Contribution > BAM 1,5 million; Supported >70 project applications (42 approved); Implementation of 24 projects (17 national, 6 international and 1 Horizon 2020 project); 15 projects in implementation supported; Educational modules on the protection of intellectual property; Entrepreneurship and Cooperation with the business sector; 'Friends Club' of the University was established; 'My Practice and the 3rd Academy' programme included 60 students of the University of Banja Luka, 15 of whom got employment.

Protected area – University Campus: area of the complex 28 hectares; rich and diverse flora; built during the Austro-Hungarian era as a military facility, the place where the Rectorate, faculties, botanical garden and student dormitory are located.

Faculty of Agriculture (FABL): established in 1992; Bachelor, Master and Doctoral Studies. Academic staff: 70 university professors and teaching assistants; 12 departments: 6 Crop Production Study Programs, 4 Animal Production Study Programs, 2 Agricultural Economy and Rural Development Study Programs; 6 Institutes: Institute for Agroecology and Soil, Institute for Horticulture, Institute for Farming, Institute for Animal Husbandry, Institute for Agricultural Economy and Rural Development, Institute for Reproduction of Domestic Animals. 17 Laboratories, 2 Computer Rooms, Experimental Educational Center (50 ha).

3.9. Technical University of Moldova, Faculty Urbanism and Architecture (Moldova)

Technical University of Moldova (TUM) is the only higher education institution in the Republic of Moldova offering engineering and technological programmers. The university was set up in 1964. It is subordinated to the Ministry of Education. It has been accredited by the Ministry of Education.

Currently, the Technical University of Moldova registers a total of 11,500 students. The institution offers courses in about 150 specialties and specializations, within 11 faculties: Faculty of Electronics and Telecommunications; Faculty of Energetics and Electrical Engineering; Faculty of Computers, Informatics and Microelectronics; Faculty of Food Technology; Faculty of Mechanical Engineering and Transport; Faculty of Architecture and Urban Planning; Faculty of Constructions, Geodesy and Cadastre; Faculty of Economic Engineering and Business; Faculty of Design; Faculty of Veterinary Medicine; Faculty of Agricultural, Forestry and Environmental Sciences.

TUM also provides postgraduate education (Master's and Doctoral degrees), as well as refresher training courses for the academic staff. Over the 59 years of its activity, TUM has succeeded in preparing an extensive number of specialists, with an employment rate of 85%. The University includes a Tech-Science Library with reading rooms, workshop spaces for digital manufacturing, as well as IT centers.

The Faculty of Architecture and Urban Planning is dedicated to training specialized personnel in the field of architecture, urbanism and related services. The Faculty of Urbanism and Architecture assumes the following didactic, scientific and cultural missions:

- Training professionals with university, postgraduate and specialization training in the fields of professional training: Architecture and Urbanism, Interior Design, Water Supply and Sewerage, Gas Supply, Heating and Conditioning, Environmental Protection, Materials Technology, Mechanical Engineering;

- Adopting educational programs subordinated to contemporary requirements in art, science, technology and ceramic creation; Scientific and technological research, technical and artistic creativity in the field of constructions, installations and modern technologies.

Scientific research is carried out in the following main application areas:

- engineering equipment and modern heating, ventilation, air conditioning installations to ensure comfort and indoor air quality,
- efficiency of heat, gas, heating, ventilation systems,
- efficiency of water supply and sewage systems,
- energy saving and energy efficiency of engineering systems,
- treatment of surface and groundwater in the water basins of the Republic of Moldova,
- treatment of domestic and industrial wastewater, with treatment of sewage sludge,
- technical audit of enterprises providing services in the field of water supply and sewage,
- normative calculation of technological water volumes and water losses in water supply and sewage systems.

3.10. University of Agriculture in Krakow, Faculty of Environmental Engineering and Geodesy (Poland)

The University of Agriculture in Krakow is a public academic institution specializing in research and education in agriculture, food sciences, forestry, and environmental protection. In 1972, the University of Agriculture became an independent institution, named after Hugo Kołłątaj, a prominent reformer and educator. The University offers modern higher education programs, emphasizing innovation in curricula and teaching methods. Students have access to the latest theoretical and practical knowledge, which they can apply in real-world conditions. The University promotes academic mobility, particularly within Europe, and supports international cooperation in research and education. The University of Agriculture offers accredited bachelor's, master's, and

doctoral programs, as well as lifelong learning opportunities. It is actively involved in research and development, addressing key challenges related to food security, climate neutrality, and sustainable development. Research efforts often focus on innovative solutions in agriculture, agri-food systems, and environmental management. One of the University's key faculties is the Faculty of Environmental Engineering and Land Surveying, which traces its roots back to the creation of the Faculty of Water Reclamation in 1955.

The Faculty fulfills two main functions: educating specialists and conducting research, enabling graduates to meet the evolving demands of sustainable resource management. Academic programs include environmental engineering, geodesy, spatial planning, water management, and landscape architecture. Research at the Faculty focuses on critical environmental elements such as water, soil, and air, utilizing modern geodetic and IT technologies. Findings are implemented in practice, contributing to staff development and curriculum updates. The Faculty actively collaborates with national and international academic institutions on joint research and educational projects. Its mission is to support the intellectual development of society and the sustainable development of the country, particularly addressing the needs of rural areas in southern Poland. High-quality education and strong ties to professional practice ensure that graduates are highly valued specialists in the job market.

The Department of Sanitary Engineering and Water Management is one of the organizational units of the Faculty of Environmental Engineering and Land Surveying. The Department's research activities focus on advancing scientific foundations in water and wastewater management, the design and operation of rural water supply and sewerage systems, and the management of water resources in natural and anthropogenic catchments. Research covers a wide range of topics, including the analysis of wastewater discharge variability and temperature in rural systems, factors affecting the efficiency of small and household wastewater treatment plants, the development of innovative sand filters for household systems, the use of porous waste materials in water and wastewater treatment, hydrological modeling in diverse catchments, and the assessment of reservoir retention in shaping water resources. The Department also studies rainwater management using semi-natural solutions, the impact of hydrogeological conditions on the quality and chemical composition of water used for rural water supply, and the reliability of water supply systems. It conducts research on minimizing water losses and the impact of infiltrating water on sewage treatment plant operations. Its activities significantly contribute to engineering practice and education, supporting the sustainable development of rural areas and the protection of water resources in the face of contemporary water management challenges.

3.11. University of Prishtina, Faculty of Civil Engineering (Kosovo*)

University of Prishtina "Hasan Prishtina" includes 14 faculties. The establishment of this university was in 1969 by the Law on the Establishment of the University of Pristina, which

was approved by the Assembly of the Socialist Province of Kosovo. The date November 9, 1965 is counted as the opening day of the Technical Faculty, with the Department of Construction, until the lesson began on December 10, 1965 with a total of 138 students, with an academic staff of five lecturers and five assistants and was held in two classrooms with 40 seats and in a 202-seat amphitheater. The Eldership of the Technical Faculty on October 30, 1967 decided to open the two sections; Machinery and Electrotechnics. As for the opening of the Architecture section, the academic staff of the Technical Faculty made a decision on May 12, 1977, until the lesson was organized in the academic year 1978/79. After 1999, the Technical Faculty was divided into three main academic units formed as the Faculty of Construction and Architecture, the Faculty of Mechanical Engineering and the Faculty of Electronic and Computer Engineering. In 2019, the Faculty of Civil Engineering and the Faculty of Architecture were formed with independent functions from each other. The Faculty of Civil Engineering offers accredited Bachelor's, Master's programs and is significantly engaged in research and industrial cooperation activities. Today, the Faculty of Civil Engineering organizes and develops study programs in BSc and MSc Construction, BSc and MSc Hydrotechnics, BSc and MSc Geodesy and BSc Environmental Engineering, with a student population of about 4,000. All accredited study programs and contemporary. The Departments: Construction, Hydrotechnics, Geodesy and Environmental Engineering are an integral part of the Faculty. They are the Laboratories of construction materials, asphalt, geomechanics, hydrotechnics, geodesy and environmental engineering as part of the Faculty's institute.

Main research and study directions of the faculty related to the network subject are:

- study and evaluation of the structure and microstructure of materials and raw materials with the aim of determining the most significant properties necessary for their optimum application in building materials,
- advanced structures and technologies in terms of their improved reliability, durability and economy during their entire life cycle,
- testing and development of new wastewater and drinking water treatment technologies,
- geodetic, photogrammetric and metrological support for building activities and research,
- development and verification of methodologies for measuring the thermal and microclimatic properties of buildings and parts of structures,
- groundwater and surface water monitoring frameworks (quality and quantity),
- establishing weather stations for monitoring and analysing meteorological phenomena and how they relate to air and water quality, etc.

4. Proposed activities in the frame of the proposed network

The proposed REWEN network represents presents the group of professional institutions in the common field of water, energy and nutrient recovery from WW. The activities of this network of professionals will aim at sharing and exchanging know-how, knowledge in the field of pedagogy, current state of the art and research of WW management. Knowledge transfer will be carried out through the exchange of teachers and Master and Ph.D. students during the project. The activities include a joint meeting of the PPUs contact persons in Vienna and two professional excursions will be done (Vienna and Brno). The enhancement of practice, knowledge and teaching will be carried out through the following activities of the professional REWEN network in the academic year 2025/2026:

i) Mobility of master students among participating institutions (min. 3 months) in order to increase the student's knowledge in relation to the master thesis.

ii) Mobility of Ph.D. students between participating institutions (min. 1 month) in order to increase the student's knowledge in relation to his/her own Ph.D. thesis. Increased collaboration between the sending and receiving institution thanks to the seconded student. A prerequisite for the internship is the work on the Ph.D. thesis as well as the preparation of a joint publication.

iii) Mobility of teachers (minimum of 6 teaching hours per week) to share know-how and transfer experience between sending and receiving institutions. Within the mobility, lessons will be conducted preferably for master students, and it is expected to establish close cooperation between the sending teacher and the receiving institution in the field of sharing teaching experience, research, publishing activities and further planning for mobility for the next years. The beneficiaries of the knowledge will not only be the master students, but also the staff in the host institution: teaching staff, but also Ph.D. students and researchers.

iv) Short Term Network Meeting "REsource for Water, Energy and Nutrients (REWEN)" is planned for the beginning of the winter semester 2025 at the BOKU - The Institute of Sanitary Engineering and Water Pollution Control. At least 50% of PPUs (contact persons), thus 6 – 11 persons from each countries, will attend the meeting at the BOKU for 3 working days. At this first meeting of the CEEPUS network, the individual contact persons will introduce their institutions through presentations and inform the meeting participants about their study programs, teaching focus, joint publications, joint research, etc.

The separate description is in Annex "4. Joint activity".

v) Short Term Excursion "Wastewater - Source of Water, Energy and Nutrients" for master water-environmental students at the BOKU - The Institute of Sanitary Engineering and Water Pollution Control is planned for the winter semester 2025. The Institute of Sanitary Engineering and Water Pollution Control (staff around 35 people) is

part of the Department of Water, Atmosphere and Environment (staff around 300 people) and one of the major Austrian research and educational organisations in the field of water quality management. Emphasising an integrated approach, competence fields / research foci comprise infrastructure management, water quality and monitoring, water treatment and processing, stormwater management, resource provision and recovery, and water resources and catchment management.

Involved students: 8 students from Rzeszów University of Technology, 4 students from Brno University of Technology, Faculty of Civil Engineering, 4 students from BOKU - University of Natural Resources and Life Sciences, Vienna.

Involved teachers: 1 teacher from Rzeszów University of Technology, 1 teacher from Brno University of Technology, Faculty of Civil Engineering, 2 teachers from BOKU - University of Natural Resources and Life Sciences, Vienna.

The separate description is in Annex "4. Joint activity".

vi) Short Term Excursion "Wastewater - Source of Water, Energy and Nutrients" for master students at the AdMaS BUT is planned for the summer semester 2026. AdMaS (Advanced Materials, Structures, and Technologies) is the research Centre of the Faculty of Civil Engineering, Brno university of technology and the AdMaS is a comprehensive research institution of civil engineering focused on research and development in advanced building materials, structures, technologies, transport systems and infrastructure of cities and municipalities.

Involved students: 8 students from Rzeszów University of Technology, 4 students from BOKU - University of Natural Resources and Life Sciences, Vienna, 4 students from AdMaS BUT.

Involved teachers: 1 teacher from Rzeszów University of Technology, 1 teacher from BOKU - University of Natural Resources and Life Sciences, Vienna, 4 teachers from AdMaS BUT

The separate description is in Annex "4. Joint activity".

vii) Cooperation on joint publications: a review article, based on the focus of the REWEN network, i.e. the review article "Wastewater - resource for water, energy and nutrients, review". The coordinators will be involved in the preparation of this joint publication, which is expected to be published in an impacted journal (Q1, Q2). Joint publications among the institutions involved are of high benefit to the teachers, researchers, but especially Ph.D. students themselves. The Ph.D. studentships are expected to prepare research articles for publication with prestigious scientific impacted journals, preferably in Q1 and Q2.

viii) Cooperation in the joint preparation of scientific research project applications. Thanks to the transfer of personnel, sharing of know-how and knowledge, joint discussion and cooperation in the preparation of joint applications for scientific research projects on the topic of WW as a source of recycled water, energy and nutrients.

ix) Discussion on the possibility of developing a future curriculum for joint double programs: masters or Ph.D. programs between selected institutions. A discussion is planned between the partners Brno University of Technology, Faculty of Civil Engineering and Rzeszów University of Technology, Faculty of Civil and Environmental Engineering and Architecture to explore the possibilities of preparing a master double degree curriculum.

x) Collaboration in the areas of joint master and Ph.D. theses, two institutions, or persons supervising and co-supervising from the other institution. Through the collaboration on joint Master and Ph.D. theses, the quality of the state of knowledge or research objectives is expected to increase.

5. Achievements and challenges

The main achievement will be the creation of the professional REWEN network for collaboration aimed at improving the quality of teaching and research activities in the field of WW as a source of recycled water, energy and nutrients. The network's achievements will also include the preparation of joint publications, the provision of professional excursions, the sharing of know-how, knowledge transfer and the development of new research and teaching / training projects.

The proposed professional REWEN network is the new project, partly based on previous cooperation among several partners. The huge challenge will therefore be to keep close cooperation among all partners, especially those that have not yet carried out joint activities. This work will ensure continuous contact among all project partners. It can also provide a basis for teaching and the development of joint research proposals in the following period. It will also be a challenge to implement all planned activities (especially master / Ph.D. student and teacher mobilities) and to maintain a high level of teaching. A strong focus on jointly supervised Masters and PhD theses and their integration into ongoing teaching at partner institutions will help to meet this challenge.

6. Selection criteria

Master and Ph.D. student and teacher mobility is the most important activity planned in the professional REWEN network. For this reason, their proper organisation is important and requires effective cooperation among local coordinators. The criteria on the basis of which the scholarships will be awarded are also important. The selection of students and teachers will always be based on CEEPUS rules, in some cases supplemented by local rules at single institutions.

7. Additional information

In some cases, CEEPUS mobility can be combined with Erasmus mobility to extend teachers' stays at partner universities. A longer stay allows not only more lectures but also the possibility to carry out joint research. Some network partners have reciprocal agreements allowing the exchange of students and teachers.

Intentional use of digital tools and enhancement of digital skills and competences. E-learning and e-teaching are effective tools that schools, universities, etc. could not do without. The use of Teams (in the case of other alternatives) offers many opportunities not only in the field of education but also in the conduct of collaborative research. If necessary, teaching materials will be created in the form of digital presentations that can be presented during lectures and online meetings. In the first year of this new network, however, we will focus on face-to-face meetings to ensure deeper interpersonal relationships. In the later years of the network, it is envisaged to increase the use of online meetings.

8. Other joint research and educational projects

The proposed network is a new project and all network partners have not yet had the opportunity to interact with each other, which is one of the reasons why a meeting of the contact persons is planned in Vienna at the beginning of the winter semester 2025. However, the members of the network (in different configurations) have a strong track record of success in implementing joint research and scientific projects. In addition to achieving the intended objectives, we believe that the network will be an impetus for further collaboration and the implementation of new projects.

Old research, mobility projects among selected partners:

- Implementation of blue-green infrastructure elements in the green building wall system, Brno University of Technology, University of Banja Luka (2024)
- Circular Waste Water Management in conditions of 4 countries: concepts, approaches and technologies, Brno University of Technology, Technical University of Kosice, Rzeszów University of Technology (2022-2023)
- Circular wastewater management - Wastewater as a local source for service water, renewable energy and nutrients, Brno University of Technology, University of Natural Resources and Life Sciences, Vienna (2022-2023)
- Innovative use of biochar in substrates and base layers of green parking lots, Brno University of Technology, University of Banja Luka (2023)
- Use of biochar as material transformed waste for extensive green roofs (2022)
- Sustainable rainwater management in the V4 countries, Brno University of Technology, Technical University of Kosice, Rzeszów University of Technology (2012-2014)