Capacity building in the field of higher education
2020 – EAC/A02/2019

TAckling the Climate change through Modernizing Environmental Engineering program – TACMEE

https://tacmee.eu/

D7.1 Project Quality Handbook

Contents

Status table

Status	Author	Changes	Date	File name
Draft	K. Kordas (UO)		19-02-2021	QMP_17-02-2021
Draft	K. Kordas (UO)	References inserted	10-03-2021	QMP_10-03-2021
Draft	K. Kordas (UO)	Input from others (QCM tasks)	24-03-2021	QMP_24-03-2021
Draft	K. Kordas (UO)	Project templates; and input from others (QCMB)	29-03-2021	QMP_29-03-2021
Draft	K. Kordas (UO)	Project templates	04-04-2021	QMP_04-04-2021
Draft	K. Kordas (UO)	Changes accepted	29-06-2021	QMP_29-06-2021b
Draft	K. Kordas (UO)	File name changed and document uploaded to Teams folder	29-06-2021	PQHB_29-06-2021
Draft	T.Enkhdul (NUM)	The list of subjects of bachelor and master program was updated	12-02-2022	PQHB_29-06-2021
Draft	Á. Filep (USZ)	Changed the name of 5th partner from SAB to MULS, uploaded to Teams folder	02-06-2022	PQHB_02-06-2022
Draft	D. Nandintsetseg /SAB, MULS/ B. Daginnas /SAB, MULS/	Insert the laboratory equipment list and names of the laboratory stations	02-10-2022	PQHB_02-06-2022

Draft	G.Gantuya (GMIT)	Insert the laboratory equipment list and name of the laboratory stations	06-12-2022	PQHB_02-06-2022
Draft	Enkhdul (NUM)	Insert the laboratory equipment list and names of the laboratory stations	07-12-2022	PQHB-02-06-2022
Draft	G. Kecskemeti (SZU)	The List of equipment was updated	06-02-2023	PQHB_v3_06-02-2023

The purpose of the Project Quality Handbook

The Project Quality Handbook (PQHB) lays down the main principles of quality assurance, which provides indicators and methods to assist the partners in the coherent execution of project tasks. The first PQHB is compiled at the beginning project by the **Quality Manager** and then updated at the aftermath of kick off meeting as well as later (every 12 months) if necessary. The handbook includes practical guidelines and recommendations for management, communication, good practices, conflict resolution, innovation management and project reporting, among others. The major tasks within the corresponding workpackage are as follows:

- 7.1. The Quality Manager (K. Kordas, UO) drafts the first version of PQH, which will be revised during the project kick-off meeting. (M3)
- 7.2. Selection of the External Expert Advisory Board (representatives of collaborating companies). (M3)
- 7.3. Revision and reporting of PQH, when needed. (M12, M24)

Note: The PQHB is a generic but important document, which is practically valid for monitoring the quality of any project (not only Erasmus+).[1] Therefore, it is advised that the participants of TACMEE familiarize themselves with its content, not only for the sake of the current project but also for utilizing its logical framework for subsequent efforts.

1. Partners and the Project Leader Board

Project partner	**PI**
P1 - University of Szeged (USZ) Coordinator	Prof. Zoltán Kónya
P2 - University of Oulu (UO)	Prof. Krisztian Kordas and Prof. Riitta Keiski
P3 - National University of Mongolia (NUM)	Dr. Enkhdul Tuuguu
P4 - German-Mongolian Institute for Resource and Technology (GMIT)	Prof. Gantuya G.
P5 – Mongolian University of Life Sciences (MULS)	Prof. Mend-Amgalan P.

2. Management

The highest management body of the project is the **Project Leader Board** (PLB) having a delegate from each partner organisation. The members will be selected at the first project meeting. PLB monitors the overall progress of the project in reference to the main objectives. PLB conveys twice a year and as the main decision body steers the actions whenever necessary. Decision is made by voting (quorum is a necessary condition to be eleigible for voting).

[1] http://eu-mong.eu/Materials/Outcomes/EU-Mong%20Quality%20management%20plan.pdf; https://silknow.eu/wp-content/uploads/SILKNOW_D1.1_m2.pdf; https://msie4.ait.ac.th/wp-content/uploads/sites/5/2018/10/QCMP-Quality-Control-and-Monitoring-Plan-v3_2018.10.12.pdf; https://www.nicopa.eu/images/downloads/documents/NICOPA%20QA%20Plan.pdf; http://www.if4tm.kg.ac.rs/pub/download/14625247744429_qa_plan_if4tm_v.4.pdf

The **Coordinator** is responsible for overseeing the executive actions and for the financial management of the project. The communication between the project and the European Commission is carried out by the coordinator. Any changes in the workplan including tasks, deliverables, timing of actions, reallocation of budget or alike shall be communicated with the Coordinator on time (i.e. in advance), who can then deliver the message to the **Project officer** (PO) and work out the protocol for corrective actions (in cooperation with the PO and workpackage leaders involved).

Workpackage leaders (WPLs) are responsible for the proper and timely execution of the tasks described in the research plan. WPLs play the key role in practical arrangements of personnel and resources to ensure appropriate conditions for the researchers in accomplishing their work. WPLs can and shall organize meetings whenever they feel necessary to do so to make sure the project tasks are progressing according to the plan. It is recommended that in every 3 months, the WPLs compile an executive summary of actions carried out, and send that to the **Coordinator** with the purpose to help him to follow up the progress.

The **External Expert Advisory Board** (representatives of collaborating companies) is proposed at the kick off meeting. The major roles of the body are (i) to provide recommendations on the contents of the curricula developed in the project, and (ii) to suggest steering of the project if necessary.

The **Quality Manager (QM)** and the **Exploitation Manager** (Prof. Akos Kukovecz) help other management parties (i.e. project **Coordinator**, the **Project Leader Board, the Quality Control and Monitoring Board (QCMB)** and the **External Expert Advisory Board (EEAB)** in monitoring the project outcomes, their timing and overall quality (scientific, educational, ethical). The Quality Manager compiles and updates the project quality handbook.

To ensure the quality of the TACMEE project, following tasks are set to the QCMB:

- Help/support the work of QM throughout the project;
- Monitor the progress of the project execution based on the project meetings and received reports;
- Evaluate the development of both B.Sc. and M.Sc. degree programmes together with QM and EEAB;
- Decide whether any changes in the project Quality Handbook (PQHB) is necessary based on the progress reports and the project meetings;
- Prepare the midterm report together with QM based on progress reports and utilizing the survey done to the EEAB;
- Prepare the final report together with QM focusing especially on the sustainability of the project results.

Quality Control and Monitoring Board

Project partner	Board member
P1 - University of Szeged (USZ) Coordinator	Dr. Agnes Filep
P2 - University of Oulu (UO)	Dr. Satu Pitkääho (Chair)
P3 - National University of Mongolia (NUM)	Dr. Soyol Erdene
P4 - German-Mongolian Institute for Resource and Technology (GMIT)	Dr. Ariuntuya Tserendorj
Mongolian University of Life Sciences (MULS)	Daginnas B.

Companies associated with the project, from which 3 delegate members are selected to the **External Expert Advisory Board (highlighted in the table with bold fonts)**

Name of organisation	Type of institution	Website	City, coutry	Representative
Kempeleen vesihuolto Ltd/ Lakeuden keskuspuhdistamo Ldt	Company	https://kempeleenvesihuolto.fi/	Kempele, FIN	CEO Hannu Roikola, hannu.roikola@kempeleenvesihuolto.fi
Csongrád Megyei Mérnöki Kamara	Government Agency	https://www.csmi-mernoki-kamara.hu/	Szeged, HUN	Dezső Bodor, bodor@szegedivizmu.hu
Mongolian Association of Environmental Engineer Professionals	NGO	Mseep.org	Ulaanbaatar, MGL	javkhlan.ariunbaatar@gmail.com

3. Communication

Multiple communication channels are used throughout the project. While the major pillar of communication is represented by the face-to-face regular meetings (planned originally twice a year) for the seamless execution of the practical tasks in the project, it is vital to have smaller meetings via phone and video conferences (in particular at the beginning of the project due to the ongoing COVID pandemic). According to previous experiences of USZ and UO in EU projects, it is highly recommended to practice the following actions:

- Monthly video conference of partners working on their WP to ensure nearly real-time monitoring of the progress. The **WPL** organizes the meetings.
- Compilation of quarterly executive summaries by each **WPL** about the actions carried out in their WP, which are then sent to the **Coordinator**, who can then decide whether the project is progressing as expected. If not, measures shall be taken to steer the project back to the original track.

- In case of delays in reporting or failing to complete any deliverable item is foreseen, the **WPL** shall inform the **Coordinator** in due course. It is very important, since any deviation from the research plan is expected to be communicated with the PO, who then either acknowledges the delay or requests an amendment of the Project Plan.

4. Conflict resolving actions

Each participant of TACMEE shall identify any conflicts that may come up in the course of the project, either personal, financial, scientific, ethical, legal or alike. While the Grant Agreement includes the major guideline for conflict resolution we amend those with the following items:

- Before starting any dispute, every researcher and project member shall follow common sense and think twice whether the conflict is real or just virtual
- Researchers shall inform their WPL (or the Coordinator) when any real conflict is foreseen or has already arisen
- The Coordinator shall mitigate the conflict by mediating the conversation between the parties. In case the conflict escalates, the next body to be involved is the PLB (and the PO, if necessary).
- Although conflicts shall be resolved within the consortium, if necessary the parties may find their right at the court as specified in the Grant Agreement (GA).

Very important: Whenever any problem occurs, always communicate with the WPL and (if needed to resolve the problem) with the Coordinator. Lack of proper communication can only postpone the problems but cannot resolve those, and will ultimately delay the project.

5. Data management plan

At the early stage of the project, it is recommended to collect information on the type and amount of data to be generated in our effort to find the best method for professional and safe archival e.g. on institutional backup servers and repositories (having permanent address) in an organized manner.[2] The way and location of storing, and accessibility rights of files and deliverables shall be decided at the first project meeting. It is important to note here, that not only the EU but also publishing houses expect transparent and publicly available data unless specified otherwise. In the practice it means, that any non-classified data (including raw and processed) shall be made publicly available, and publications shall be made open access (either green or gold).

Particular attention shall be placed on the proper use and distribution of copyrighted contents (e.g. in lecture slides) to avoid potential infringement and legal consequences. Furthermore, although any collection of personal data is not expected in the project, it is important to highlight here that collection, handling and use of such data is regulated very strictly by the recently introduced data privacy and security law (GDPR) in the EU.[3]

[2] As decided in the meeting 25 June 2021, the working files will be uploaded to a MS Teams project folder hosted by the University of Szeged, whereas the final files are going to be archived on a cloud server, NextCloud.
[3] https://gdpr.eu/what-is-gdpr/

6. Innovation management

Although the project is neither a Research and Innovation Action nor Innovation Action, innovative solutions for teaching and education may arise during the execution of project tasks. The Coordinator, Workpackage Leaders and the Quality Manager will oversee and discuss if any protectable innovation occurs, and then contact the Innovation Office (or alike) at the corresponding University to seek for potential solutions to protect the innovation (e.g., by filing disclosures, and/or patents). Please note, that public dissemination either talk, newsletter, poster, scientific paper or alike prior filing disclosure/patent can greatly undermine the protection process.

7. Good practices

Each member of the consortium shall:

- Follow good scientific and ethical practices to ensure the integrity of research carried out in the project.[4]
- Adhere to the highest standards of equality including ethnicity, gender, religion, age, etc.[5]
- Protect our environment by limiting the use of natural resources, saving energy, etc.[6]

8. Project reporting

At the time of writing and submitting the proposal, the COVID-19 pandemic has not been seen, which turned out to be an influencing factor for the start of the project, and thus will cause a shift of the timing of deliverables. Accordingly, timings of deliverables (listed in the Appendix) and project meetings shall be confirmed (or modified if necessary) at the kickoff meeting to avoid any confusion later. Some practical hints for the proper timing of delivery items:

- It is useful to start organizing the personnel of each WP and task already several weeks before the eventual activity starts
- The work shall be continuously managed and executed during the particular action
- The deliverable shall be submitted at the end of the completion of action as scheduled to leave time for potential revisions/corrections (viz. the official submission deadline is 2 months after scheduled end of task).
- The Coordinator submits the checked and approved official reports to the European Commission according to the schedule agreed in the proposal (any delay shall be discussed already at the kickoff meeting).

Deliverable	Title	Month	Lead
1.1	Need analysis report	M5	P3
1.2	Learning outcomes	M6	P3

[4] https://allea.org/code-of-conduct/

[5] https://www.un.org/ruleoflaw/thematic-areas/human-rights/equality-and-non-discrimination/

[6] https://www.europarl.europa.eu/factsheets/en/sheet/71/environment-policy-general-principles-and-basic-framework

2.1[7]	Drafting of the directions (B.Sc.)	M7-9	P1
2.2[7]	Syllabi and ppt slides presentations and practical exercises	M18, M24, M30	P1
3.1[8]	Drafting of the directions (M.Sc.)	M9	P1
3.2[8]	Syllabi and ppt slides presentations and practical exercises	M18, M24, M30	P1
4.1	Thematics, requirements and outcomes as well as syllabi and practical questions of the environmental engineering laboratory	M30	P1
4.2	Improving and Purchasing and installing new environmental engineering units into the labs of all 3 Mongolian institutes	M30	P1
5.1[9]	Training of the Academic staff of Mongolia	M13, M24, M30	P2
6.1[10]	Massive Open Online course (MOOC) packages	M30	P1
7.1	Project Quality Handbook v1	M3	P2
7.2	Project Quality Handbook v2	M12	P2
7.3	Project Quality Handbook v3	M24	P2
8.1	Project website and social media appearance	M3	P3
8.2	Project brochure	M3	P3
8.3	Workshops	M12, M24, M36	P3
8.4	Exploitation management	M18, M36	P3
8.5	Open access publishing	M3	P3
9.1[11]	Project reports		P1

[7] See Appendix I

[8] See Appendix II

[9] A5.1. 3-5 days long training in Oulu for courses of Finnish BSc and MSc as well the laboratory courses, MOOC packages (combined with dissemination workshops to optimize travel costs)

A5.2. 3-5 days long training in Mongolia for teachers, MOOC packages (combined with dissemination workshops to optimize travel costs)

A5.3. 3-5 days long training in Hungary for MSc and BSc courses including laboratories, MOOC packages (combined with dissemination workshops to optimize travel costs)

[10] Massive Open Online courses (MOOC) with 4 packages including 7-14 pieces of 30-90 min video lectures of the courses, monitoring check questions for each video, 7-14 pieces of presentation with 20-80 slides, with 20-100 exam questions

[11] Progress report and final project reports with: all project deliverables, learning environment and materials development, evaluation, dissemination and exploitation; and financial reports.

Appendix I: Courses to be delivered for the B.Sc. programme

Course title	Lead	Date[12]
Environmental Engineering	USZ	
Solid Waste treatment and technologies	USZ	
Water and wastewater treatment	USZ	
Alternative Energy Resources	USZ	
Environmental chemistry and ecology	UO	
Microsensors and controllers	UO	
Air pollution control engineering	NUM	
Solid waste management and recycling technologies	NUM	
Water and wastewater treatment	NUM	
Hydrology and water resources	NUM	
Material recovery technology	NUM	
Climate change	GMIT	
Air pollution	GMIT	
Solid waste technologies	GMIT	
Rangeland management and technology	MULS	
Environmental monitoring and assessment	MULS	

[12] To be defined more accurately, what is needed for the accreditation and when the actual elements of the courses are due.

Appendix II: Courses to be delivered for the M.Sc. programme

Course title	Lead	Date[13]
Life cycle analysis	USZ	
Environmental biotechnology	USZ	
Modelling and simulation	USZ	
Environmental operation units	USZ	
Process and environmental catalysis	UO	
Industry and environment	UO	
Air pollution control engineering	UO	
Materials in environmental engineering	UO	
Micro and nanotechnologies	UO	
Mitigation and adaptation technologies	NUM	
Waste recycle technology	MULS	
Climate change Modelling and simulation	MULS	
Sustainable development and green theory	MULS	

[13] To be defined more accurately, what is needed for the accreditation and when the actual elements of the courses are due.

Appendix III: List of equipment

NUM

№	Name of the equipment	Pieces	Technical specification
1	Jar tester, 6 blades	1	6 independent ligh source for each stirring point, 6 paddler stainless steel shaft-diameter 8xL400mm; straigt blade w75xh25mm Stirring capacity: 6x1liter beaker Motor&power: geared DC motor with timing belt (10:1 ratio(, 40W Speed & accuracy: 20-300 rpm, Timer: 99 hr 59 min 59 sec (programmable) Display: Digital LCD with Back-light for RPM, power Bar-graph and status Controller: Programmable digital feedback controller with jog-shuttke switch Program function: 10 steps, 6 programs, storage for set values: RPM and timer Florescent lamp: 20Wx6 (independent light source for each sample) Dimension: 1000x310x535 Safety device: Overloadxover heat protector for motor Others: PL insurance and storage function Gross weight: 1120x430xh740mm, 69 kg
2	Thermo Scientific Niton XL3T 900 Goldd+ XRF Analyzer Flaw Detector PMI Gun NDT	1	The Niton XL3t 900s-HE GOLDD + Hand-held XRF Analyzer is our ultimate performance and feature instrument used throughout the manufacturing, fabrication, engineering and scrap recycling industry to determine positive material identification. With the Niton XL3t 900s-HE GOLDD+ you don't have to risk your business or your reputation on the accuracy of supplier documentation or miss analyse your scrap, therefore saving you both time and money. Fast, accurate, non-destructive lab quality results are now available with the XL3t 900s-HE GOLDD+ hand-held XRF analyser. Features : Rapidly verify alloys Recover lost material traceability Isolate finished welds to validate filler material and dilution Confirm the integrity of pipes and valves Superior detection limits for tramp & trace elements Unrivalled light element performance for Aluminium, Titanium, Bronzes, Zinc alloys, Superalloys, Low carbon steels and Specialty steels Standard camera for close identification and weld analysis Optional small spot feature down to 3mm NDT software for downloading data and printing certificates

3	Portable water multiparameter, Horiba, U-52G	1	pH, temp, DO, ORP, Salinity, turbidity, Cond. TDS, water depth, GPS Meter Type: Portable Display type: LCDMin pH (pH)0Max pH (pH)14pH Resolution0.01/0.1pH Accuracy±0.1 Buffer RecognitionDIN, NIST, and USA Min Conductivity0 mS; Max Conductivity100 mS; Conductivity Resolution0.001, 0.01, or 0.1 mS; 0.001 or 0.01 S Conductivity Accuracy±1% FSTurbidity Resolution0.1 NTU Dissolved Oxygen Resolution0.01 ppm Temperature compensationAutomaticInterfaceUSBData Logging (points)10,000 data sets Width (cm)11.43Height (cm)28.2575Width (in)4 1/2Length (in)2Height (in)11 Description: Multiparameter Meter, 6-ft (2-M) Cable
4	CEXC-A chemical reactor service unit, Armfield	1	A self-contained benchtop service unit designed to provide services for up to five different chemical reactors:- Continuous Stirred Tank Reactor – CEM-MKII- Tubular Reactor – CET-MKII- Transparent Batch Reactor – CEB-MKIII- Laminar Flow Reactor – CEY- Plug Flow Reactor – CEZ Fully computer controlled and supplied with educational software specific to each reactor type. Simple interfacing to the (user supplied) computer by a USB interface Two peristaltic feed pumps with individually variable flow rates 0-140 ml/min Provides PID temperature-controlled hot water in order to maintail reactor temperature Complete with two thermocouples, an input for a third (user) thermocouple and a dual-range conductivity sensor A comprehensive instruction manual is included which details installation and operating procedures Electrical supply: Single phase Software requires the user to have a PC running Windows 7 or above with a USB port. Volume: 0.4m³ Gross Weight: 45Kg Length: 1.00m Width: 0.50m Height: 0.50m

5	CEX-laminar flow reactor, Armfield	1	The CEZ Laminar flow reactor is a tubular reactor made of clear acrylic, mounted on a floor standing steel frame with two diffusers packed with glass beads located at the ends. A static premixer at the bottom of the column provides premixing of the reagents entering the reactor to improve the flow distribution. It includes two reagent vessels fitted with heat exchangers, mounted on the CEXC plinth. The heat exchangers are used to cool down the reagents before performing the experiment. A cold water jacket keeps the reactor contents at constant temperature in order to maintain the laminar characteristic. A thermostatically controlled supply of chilled water is required for this such as the CW-17. A clear acrylic sensor block is mounted on the frame for the CEXC conductivity and temperature sensors. The reagents are fed to the reactor by the CEXC peristaltic pumps using PTFE tubing. Pulsation dampers are used to ensure a smooth flow. Tracer experiments and conversion experiments may be demonstrated and followed visually. Conductivity data logging allows the student to apply the flow pattern characterisation theory and compare it with the experimental results. Specifications - A small scale laminar flow reactor (400ml working volume) designed to demonstrate both flow pattern characterisation and steady-state conversion in a tubular reactor - The reactor column is 1300mm long including diffusers packed with glass beads - A static premixer is fitted at the base of the column - Reactor column is jacketed with easy connections for recirculating cooling system - A feed assembly is supplied with the reactor which consists of two pulsation dampers mounted on a base plate, special lids for Service Unit reagent vessels and PTFE interconnecting pipe - Stainless steel coils are mounted on the reagent vessel lids to cool their contents. Quick-release connectors allow easy supply of cold transfer medium to the coil and reagents - The unit is mounted on a painted frame and includes a sensor block for conductivity and temperature sensors - Can perform flow visualisation where the progress of the reaction can be monitored visually using colour - Can also perform true reactions where the progress of the reaction is recorded using the CEXC conductivity sensor and compared with the theory Volume: 0.5m³ Gross Weight: 22Kg

6	Handheld Odor Meter OMX-ADM	2	Model Name OMX-ADM Detection Method Two Semiconductor Gas Sensors Sampling Method Continuous Sampling with Built-in Air Pump Object Gas Hydrogen Sulfide, Methyl Mercaptan, Ammonia, etc Odor Strength Level 0 - 999 Classification Odor Intensity 2.5～5.0 Power 4×AASize Alkaline Batteries or AC Adaptor *Battery life for continuous measurement is approx. 7 hours. Memory Capacity Up to 32,732 Data Memory Partition Up to 511 Files Operating Temperature 0 ～ 40□(32-104F) *No Dew Condensation Storage Temperature -10 ～ 50□(14-122F) *No Dew Condensation Dimensions W74 X L167.5 X D35mm approx. Weight 250g approx. (Without Batteries) Accessories USB Cable, Air Purifying Unit, Activated Carbon, 4×AA Size Alkaline Batteries, AC Adaptor
7	Total carbon analyzer with autosampler	1	Measurement Method: 680 °C combustion catalytic oxidation – non-dispersive infrared detection (NDIR) method Measured Items: TC, IC, TOC (= TC-IC), NPOC (TOC measurement via acidification and sparging) Measurement Range: TC: 0 to 30,000 mg/L; D23IC: 0 to 3,000 mg/L; optional TN: 0 to 10,000 mg/L; POC: 0 to 500 mg/L Detection Limit: TC: 50 µg/L, IC: 4 µg/L, TN: 20 µg/L Reproducibility: TC, NPOC: CV 1.5 % max. or ±50 µg/L max, IC: CV 1.5 % max. or ±4 µg/L max Measuring Time: TC: approx. 3 min, IC: approx. 4 min Sample Injection: Automatic sample injection using a syringe pump and slide type injection mechanism Sample Injection Volume: TC: 10 to 150 µL variable, IC: 10 to 4,500 µL variable IC Removal: Automatic addition of acid and sparging Display and Operations: Operation by color LCD screen and keyboard *Operation by PC is also possible External Memory (Standalone Type): USB flash memory used Carrier Gas: High-purity air (CO, CO2, HC content: Each 1 ppm max., dew point: -50 °C max.) Supply pressure: 200±10 kPa (Additional use of optional carrier gas regulator: 300 to 600 kPa) Optional use of nitrogen gas (not possible in the TN measurement). With the standard model, optional use of pressurized gas. Gas Consumption: 230 mL/min (A separate 100 mL/min is required for sparging with ASI-L. (variable flow rate)) Power Supply: 100 to 240 V AC, 600 VA (Permitted range: 90 to 264 V AC) Ambient Temperature Range: 5 to 35 °C Dimensions: W340 × D660 × H480 mm (Excluding protrusions. For details, see the External Dimensions Diagram.) Weight: 35 kg Autosampler: Vial Types Select from three types: 9 mL, 24 mL, 40 mL

			Number of Vials: 9 mL: 93, 24 mL: 93, 40 mL: 68 Vial Septum: With dedicated septum (excluding 9 mL vials) Sample Sparging: Possible (The optional external sparging kit is required.) Dimensions: W370 × D540 × H490 mm (excluding protrusions) Weight: Approx. 14 kg
8	Sediment core samples	1	The Kit includes: 1 AMS multi-stage sludge sampler 1 multi-stage sludge core tip 1 12" multi-stage SCS base 3 12" multi-stage SCS sections 3 4' extensions 1 plastic liner 1 plastic end caps 1 2" soil core catcher 1 universal slip wrench 2 crescent wrenches 1 SST cross handle 1 slide hammer 1 the AMS deluxe carrying case Weight: 65.1 lb
9	Aerosol monitor DustTrak 8530	1	Measure aerosol concentrations corresponding to PM1, PM2.5, respirable, PM10 or size fractions STEL alarm setpoint TrakPro data analysis software Automatic zeroing (with optional zero module) minimizes the effect of zero drift Perform in-line gravimetric sampling for custom reference calibrations Manual and programmable data logging functions Aerosol concentration range 0.001 to 400 mg/m3 Desktop unit with battery and AC adapter Sensor Type: 90° light scattering Particle Size Range: 0.1 to 10 µm Flow Rate: 3.0 L/min set at factory, 1.40 to 3.0 L/min, user adjustable Flow Accuracy: ±5% of factory set point, internal flow controlled Temperature Coefficient: +0.001 mg/m3 per °C Operational Temp: 32 to 120°F (0 to 50°C) Storage Temp: -4 to 140°F (-20 to 60°C) Operational Humidity: 0 to 95% RH, non-condensing Time Constant: User adjustable, 1 to 60 seconds Data Logging: 5 MB of on-board memory (>60,000 data points), 45 days at 1 minute logging interval
	Total		

GMIT

№	Name of the equipment	Pieces	Technical specification
1	Drone	1	aircraft with remote controller; 55 min flight time; operating temperature -20C to 50C; max payload 2.7 kg; net weight 8.37 kg;
2	High performance computing server	1	Intel system; 36 cores max; Xeon scalable; Linux/Unix OS;
3	Meter, Soil pH	1	Specification Range: pH: 3.0-14.0 pH; Resolution:0.10 pH; Accuracy: ± 0.2 pH(3.0-12.0 pH); Operating Temp: 5-45 ℃ Power supply:DC 9V (L1022 battery); Display: LCD
4	Soil pH	1	Measuring range: pH3-8 - Accuracy: ±0.2-0.4 - Size: length 17cm, piercing tip 6.5cm, weight – 0.24kg - Battery: batteries not required
5	Gas analyzer TESTO350	1	Exhaust gas analyser with up to 5 gas sensors for CO, NO, NO2, SO2, H2S, CxHy and CO2.
6	Vehicle mounted weather station	2	Temperature range -40-+80C; accuracy 0.1C; wind speed 0-60m/s; pressure 150-1020 hPa;
7	Portable weather station	1	Temperature range -50-+100C; wind speed and direction; scattering radiation; total and direct radiation; data collector, power supply;
8	Aerosol monitor DustTrak 8530	2	0.001-400 ug/m3; 0-50C; 3L/min;
9	Ionometer	1	Precision ± 0.1 °C / ± 0.002 pH / ± 0.2 mV or ± 0.05% Resolution 0.1 / 0.01 / 0.001 Protection IP54 Weight 0.9 kg Canals Monocanal Specificity pH : -2.000 to 20.000 Specificity mV : -2000.0 to +2000.0

10	Personal sound Level Meter	2	30-130 db; 1 dB resolution; 0-50C; RH<90%;
11	Laptop	2	Intel Core i7; RAM 16GB; SSD 512 GB; FHD 1920 x 1080; Win11;
12	Personal computer	2	Intel® i7-11700 RAM 8GB DDR4 Intel HD Graphics 1TB HDD
	Total		

MULS /SAB/

№	Name of the equipment	Pieces	Technical specification
1	Multi-parameter Analyzer, Bench-top, DZS-706	1	pH:Range (-2.00～20.00)pH Resolution 0.01pH Accuracy ±0.01pH mV Range (-1999.9-1999.9)mV Resolution 0.1 mv Accuracy ±0.1%FS
2	Thermo GENESYS™ 10UV UV-Vis Spectrophotometer	1	Detector: Dual silicon photodiodes Lamp: long-life xenon lamp (5 years) for stability and drift-free readings Wavelength range: 190 to 1100 nm Spectral bandwidth: 5 nm Wavelength accuracy: ±1 nm Wavelength repeatability: ±0.5 nm Stray light: <0.1% at 220 nm, 340 nm, and 400 nm
3	Laboratory Ultra-Pure Water Purification System	1	Inlet water quality: Tap water (conductivity < 400 μs/cm) Inlet water temperature: 5-400C Inlet water pressure:0.1-0.5 Mpa Outlet water quality: Pure water, ultra-pure water Water production rate: 15, Conductivity: <20 μs/cm Desalination rate: 95-99%
4	PHANTOM 4 D-RTK DRON	GNSS Mobile station	1cm+1ppm RTK Horizontal Positioning Accuracy, 1.5cm+1ppm RTK Vertical Positioning Accuracy, 5cm* (*When flying at 100m height, 2.7cm GSD, sunny.) Absolute Horizontal Accuracy of Photogrammetric Models

5	Thermo Scientific Niton XL3T 900 Goldd+ XRF Analyzer Flaw Detector PMI Gun NDT	1	The Niton XL3t 900s-HE GOLDD + Hand-held XRF Analyzer is our ultimate performance and feature instrument used throughout the manufacturing, fabrication, engineering and scrap recycling industry to determine positive material identification. With the Niton XL3t 900s-HE GOLDD+ you don't have to risk your business or your reputation on the accuracy of supplier documentation or miss analyse your scrap, therefore saving you both time and money. Fast, accurate, non-destructive lab quality results are now available with the XL3t 900s-HE GOLDD+ hand-held XRF analyser.
6	CEXC-A chemical reactor service unit, Armfield	1	A self-contained benchtop service unit designed to provide services for up to five different chemical reactors:- Continuous Stirred Tank Reactor – CEM-MKII- Tubular Reactor – CET-MKII- Transparent Batch Reactor – CEB-MKIII- Laminar Flow Reactor – CEY- Plug Flow Reactor – CEZ Fully computer controlled and supplied with educational software specific to each reactor type. Electrical supply: Single phase Software requires the user to have a PC running Windows 7 or above with a USB port. Volume: 0.4m³, Gross Weight: 45Kg, Length: 1.00m, Width: 0.50m, Height: 0.50m
7	Handheld Odor Meter OMX-ADM	2	Model Name OMX-ADM Detection Method Two Semiconductor Gas Sensors Sampling Method Continuous Sampling with Built-in Air Pump Object Gas Hydrogen Sulfide, Methyl Mercaptan, Ammonia, etc Odor Strength Level 0 - 999 Classification Odor Intensity 2.5～5.0 Power 4×AASize Alkaline Batteries or AC Adaptor *Battery life for continuous measurement is approx. 7 hours. Memory Capacity Up to 32,732 Data Memory Partition Up to 511 Files Operating Temperature 0 ～ 40□(32-104F)
8	Air Quality Monitor w/ PM2.5, TVOC, HCHO, Temp/Humid (B078ZS8RVL)	2	2.8“ color 240 x 320 LCD -DC 5V USB charging w/ 2-3 hrs battery life -HCHO: 0-1.999 mg/m³ -TVOC: 0-9.999 mg/m³ -PM1.0/PM2.5/PM10: 0-999 µg/m³
9	Draeger Safety X-am 5000 Gas Monitor with O2,LEL,CO, H2S Sensors and Charger	2	Operation time:>12h Dimensions (W × H × D): 0.16x0.43x0.14 ft Weight: 0.49 lb Battery type: NiMh Degree of protection (IP class): IP 67

10	GiiHoo Portable 4 Gas Monitor Personal, Sound Light Vibration Multi-Gas Detector Meter	2	Display Error ≤ ± 5% FS Response Time <30 s Working Environment -20 ~ 50 , <95% RH (no dew) Power Source DC 3.7V Li-on battery, 1800mAh Protection Grade IP65
11	CEM DT-8820 4 in 1 Multifunction Environment Meter with Sound Level Meter, Light Meter, Humidity, and Temperature Fuction	2	Brand new in retail box. ; Display: 0 - 1999 count. 4 in 1 for Light meter, Sound Level meter, Relative Humidity meter, Temperature meter. 3 1/2 digit large LCD display with units of Lux, oC, oF, %RH and C & dB, A & dB indication. Auto power off. ; Data hold and Maximum hold, Accessories: 9V battery, temperature probe.
12	Radiation Detector PCE-RAM 10	2	Types of radiation α-, β-, γ- and x- radiation Measurement ranges Radiation dose rate: 0.01 - 1000 µSv / h Pulse dose rate: 0 - 30,000 cpm, 0 ... 5000 cps Radiation dose accumulation: 0.001 µSv . 9.999 Sv Pulse dose accumulation: 0 ... 9,999 Sensitivity 108 pulses or 1000 cpm / mR / hr in Cobalt-60 irradiated environment with current of 1 µSv / h, Alpha rays: from 4 MeV Beta rays: from 0.2 MeV Gamma rays: from 0.02 MeV X-rays: from 0.02 MeV
13	Gas analyzer TESTO350	1	Exhaust gas analyser with up to 5 gas sensors for CO, NO, NO2, SO2, H2S, CxHy and CO2. Weight: 4800 g, Dimensions: 330 x 128 x 438 mm, Operating temperature: -5 to +45 °C, Connectable probes: 1 x combustion air temperature probe; 1 x flue gas probe; 1 x temperature probe; 1 x differential pressure, Product colour: Black, Battery type: lithium batteries, Battery life: 5 h, Power supply: AC mains unit 100V to 240V (50 to 60 Hz), DC electric tension input: 11V to 40V, Pump flow: 1 l/min.
14	High performance desktop computers for research and training	15	Dell Optiplex 5480 AIO i7-10700T 16GB 1TB IPS Touch Display KM636 KB Mouse
15	Lovibond™ ET 740 and ET 750 Jar Tester	1	Production type: Laboratory Flocculation tester Resolution: 1 Revolution Electrical Requirements: 115/230V 50/60Hz Hertz: 50/60Hz

16	Portable Digital Turbidity Meter (0~1000NTU)	2	Model: WGZ-1000B, Measuring range: 0.000NTU-1000.0 NTU, Light Source: LED, wavelength 860NM, Reading Display Method Liquid Crystal Display, Indicative error: ≤±6%, Zero drift: ≤ ±0.5% FS within 30 minutes, Repeatability: ≤0.5%, Sample bottle 25MM *65MM, Sample Volume 20ML~25ML, Weight 0.65KG
17	Chemical glassware and reagents		
	Total		

Appendix IV: Names of the laboratory stations

NUM

1. Metal recovery from e-waste by crushing and grinding
2. The study of coagulant dose for coagulation process
3. The risk estimation of elements in soil and food chain
4. The study of flow rate, concentration on the wastewater treatment
5. The measurement and estimation of odor index and modelling
6. The effect of organic pollutants on the wastewater treatment
7. Modelling air pollution and climate
8. Measurements of aerosols
9. Water quality analysis
10. Wastewater treatment efficiency measurement

GMIT

1. Measurements of flue gases
2. Numerical modeling in climatology
3. Numerical weather simulations
4. Measurements of weather parameters
5. Mobile measurements of weather parameters
6. Measurements of aerosols
7. Soil pH determination
8. Measurements of vertical profile of atmospheric elements
9. Measurements of outdoor sound level
10. Measurements of indoor sound level

MULS

1. Contaminants from fuel combustion
2. PH analysis of water and soil
3. Water quality analysis
4. Soil element analysis
5. Measurement and evaluation of the level of ambient physical parameters
6. Evaluation of indoor air quality
7. The chemical reactor / Arm field/
8. Coagulation and flocculation process of wastewater sample
9. Detecting rangeland vegetation cover and Normalized Difference Vegetation Index / NDVI/
10. Modelling air pollution and climate

Appendix V: MS Word template to be used for reporting

The MS Word template follows the same style as this document.

On the first page (i.e. title page) of the document, use project information and logos, add the title of document/report, then a table of contents and finally the table describing the status of the document:

Erasmus+

Capacity building in the field of higher education
2020 – EAC/A02/2019

TAckling the Climate change through Modernizing Environmental Engineering program – TACMEE

https://tacmee.eu/

TACMEE

DX.Y Title of Report

Table of contents

Status table

Status	Author	Changes	Date	File name
Draft	X.Y. (UO)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY
Draft	X.Y. (USZ)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY
Final	X.Y. (NUM)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY

The main contents of the document start from page 2 and formatted as this document, i.e.:

- Heading 1 for chapters and Heading 2 styles for sub-chapters
- Normal text: Calibri, font 12, line Justified, paragraph spacing 0 pt before and 8 pt after, line spacing Multiple 1,08
- Add page numbers
- Add references and footnotes[14]
- (Use track changes function of the MS Word processor in the preparation phase of the draft)

14

- Table and its caption formatting:

Table X Caption text comes here

	Column title 1	**Column title 2**
Row title 1		
Row title 2		

- Figure and its caption formatting

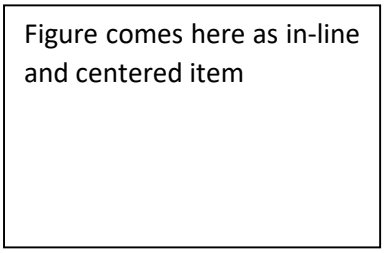

Figure Y Caption text comes here

Appendix IV: MS Power Point template to be used for reporting/presentation

On each slide of the presentation, use project information and logos

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Capacity building in the field of higher education
2020 – EAC/A02/2019

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https://tacmee.eu/

TACMEE

On the first slide, add the following items:

DX.Y Title of Presentation/Report

Add names and corresponding institutes

Table of contents (optional)

Status table:

Status	Author	Changes	Date	File name
Draft	X.Y. (UO)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY
Draft	X.Y. (USZ)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY
Final	X.Y. (NUM)	Major changes compared to the previous document	DD-MM-YYYY	DXY_DD-MM-YYYY

The main contents of the document start from slide 2 and formatted as follows:

- **Calibri, size 20 bold fonts in slide titles**
- **Calibri, size 18 bold in subtitles**
- Calibri, size 16 normal fonts in text (including tables).
- Table and figure captions also use fonts with size 16 (see examples below)
- Add page numbers
- Add references and links wherever appropriate

Table X Caption text comes here

	Column title 1	**Column title 2**
Row title 1		
Row title 2		

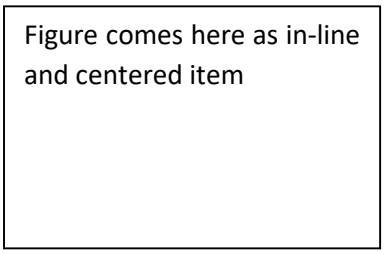

Figure Y Caption text comes here