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## D3.5: REPORT ON PURCHASED LABORATORY EQUIPMENT

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Curricula innovation in climate-smart urban development based on green  
and energy efficiency with the non-academic sector

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## List of abbreviations

EU - European Union  
EACEA - European Education and Culture Executive Agency  
WB - Western Balkans  
HEIs - Higher Education Institutions  
URJC - Universidad Rey Juan Carlos  
UoM - University of Montenegro  
UNSA - University of Sarajevo  
UNMO - Dzemal Bijedic University of Mostar  
UNBI - University of Bihać  
UET - European University of Tirana  
UPT - Polytechnic University of Tirana  
U\_POLIS - Polis University  
CSUC - Consortium of University Services of Catalonia  
CeJN - Montenegro Electronic Public Procurement System  
B&H - Bosnia and Herzegovina  
GIS - Geographic Information Systems  
SUMNE - Supply Negotiated by Exclusivity  
SUMA - Open Supply  
TPS - Transient Plane Source  
ASTM - American Society for Testing and Materials  
ALL - Albanian Lek  
DVR - Digital Video Recorder  
HD - High Definition  
CMOS - Complementary Metal-Oxide-Semiconductor  
IPS - In-Plane Switching (related to LCD screens)  
LCD - Liquid Crystal Display  
BIM - Building Information Modeling

## 1. Summary

This report, titled "D3.5: Report on Purchased Laboratory Equipment," outlines the procurement and purpose of laboratory equipment acquired under the SmartWB project, funded by the ERASMUS-EDU-2022-CBHE scheme of the European Union. Aimed at curricula innovation in climate-smart urban development and energy efficiency, the project emphasizes the collaboration between academic institutions and the non-academic sector across Western Balkan countries.

The document details the procurement procedures, needs, and specific purposes of the acquired equipment at various partnering West Balkan institutions: University of Montenegro (UoM), University of Sarajevo (UNSA), Dzemal Bijedic University of Mostar (UNMO), University of Bihać (UNBI), European University of Tirana (UET), Polytechnic University of Tirana (UPT), and Polis University (U\_POLIS). Each section provides insights into the unique requirements of these institutions, highlighting the strategic selection of equipment to enhance educational processes, research activities and practical learning in the context of sustainable urban development.

Key highlights include:

**Procurement Procedure for WB countries:** The initial chapter (Chapter 1) discuss the EU's procurement guidelines, focusing on the differentiation between minor contracts and tenders, streamlined for efficiency and compliance.

**Equipment Needs:** Chapter 3 delves into the specific equipment needs of partner institutions, justifying the selections based on educational and research requirements tailored to each institution's focus areas. In this chapter, the Report underscores the rigorous documentation, public procurement procedures, and adherence to EU standards ensuring transparency, quality, and value for money in the acquisition process.

**Purpose and Application:** Chapter 4 articulates the intended use of the purchased equipment, ranging from enhancing practical teaching methodologies to fostering research in green and energy-efficient urban development according to the framework of the project. All the equipment purchased will be used for educational processes. Emphasizing the project's broader objectives, the report reflects on how the equipment will support the modernization of curricula, facilitate hands-on learning, and promote innovative research collaborations between academic and industry partners.

Finally, chapter 5 provides photos of purchased equipment with the labels of the project and the comparative overview of the purchased equipment versus planed equipment, with the comments were two of those are different.

The report serves as a testament to the project's commitment to equipping Western Balkan Higher Education Institutions (HEIs) with state-of-the-art laboratory resources. These resources are pivotal in advancing climate-smart urban development education and research, ultimately contributing to the region's sustainable development goals.

## 2. Procurement Procedure for equipment purchasing

### 2.1 Procurement Procedure in EU Member States and third countries associated to the Programme partners- URJC (Spain)

In general, the purchase of Software and Laboratory Equipment at the University can be managed through Minor contracts and Tenders. All equipment purchases under 50.000 € can be handled as a minor contract. Any purchase over 50.000 € must be handled with the format of a call for tenders.

#### 2.1.1 Particularities of minor contracts

There are differences depending on the amount of the contract:

- If the equipment or software does not exceed 5.000 €, it is sufficient to submit a single quotation.
- If the equipment or software exceeds 5.000 €, three different quotations must be submitted. The criterion to select is the quotation with the lowest amount.
  - o There is one exception to submitting three quotations, and that is if the equipment & software is just supplied by a single company worldwide. In this case the minor contract is by “exclusivity” and the three quotations are not necessary.

#### 2.1.2 Particularities of tenders

There are two different types: SUMNE and SUMA

- SUMNE (Supply Negotiated by Exclusivity-Suministro Negociado por Exclusividad). It occurs when just one company worldwide can supply the equipment.
- SUMA (Open Supply-Suministro Abierto). Any other bidding process that does not involve exclusivity

The purchase of university equipment & software is a long process in Spain. With the purpose to speed up the procedure, a region in Spain, Catalonia has created the Consortium of University Services of Catalonia (CSUC-Consorcio de Servicios Universitarios de Cataluña) <https://www.csuc.cat/en/aboutus>. The Universidad Rey Juan Carlos is a member of this Consortium. Through this consortium, it is possible to acquire with a higher level of agility different things like – computer equipment, laboratory equipment, software licenses, gases and books –. For each type of equipment, there is an agreement that defines from which companies a quotation can be requested and under what conditions. Whenever the equipment & software can be purchased through these agreements, it should be done because of three main reasons:

- Lower Budgets
- Increased agility in the management of the purchase of equipment & software
- It does not compute as a minor contract. One of the objectives set by Universities’ economic management is the reduction of minor contracts.

## 2.2 Brief descriptions on procedures in countries of SmartWB partners

The procedures for purchasing equipment in public calls across the partners in the SmartWB project demonstrate a nuanced adaptation to local regulations, while adhering to transparency and competitive principles.

At the University of Montenegro (UoM), the procurement emphasizes inclusivity of bids, mandating conditions like delivery within 30 days and a 30-day payment term post-delivery. The selection criteria are based on technical specifications, with an emphasis on non used goods meeting the provided standards.

The University of Sarajevo (UNSA) and the University of Bihać (UNBI), following the Law on Public Procurement of Bosnia and Herzegovina (B&H), adopt a comprehensive procedure starting with procurement planning and concluding with contract management. Their process includes public notification, evaluation by a commission, and a transparent awarding phase, with a distinct focus on the most economically advantageous offers. Specific to UNSA and UNBI, the evaluation also considers the lowest price and requires an e-auction if the lowest price is the criterion.

Dzemat Bijedic University of Mostar (UNMO) shares a similar framework, aligning with B&H's public procurement law. The process is meticulous, from procurement planning to finalizing the contract, ensuring compliance with legal standards and fostering competition. Notably, UNMO requires a detailed tender documentation and market check to estimate the procurement value, selecting bids through a competitive request for bids based on price or the most economically advantageous offer.

The European University of Tirana (UET), being a private institution, exercises more flexibility in its procurement process, allowing direct market purchases without the necessity for a bidding process. This approach facilitates expedited procurement but is distinct from the public institutions' rigorous tender procedures.

The Polytechnic University of Tirana (UPT) and Polis University engage in a structured tendering process, reflective of their respective national regulations, with an emphasis on detailed technical specifications and competitive bidding. UPT's procurement, detailed through tender documentation posted online, is notable for its focus on technical and legal capacity verification of bidders, ensuring compliance and quality. Polis University highlights the importance of technical compliance and competitive financial offers, with a transparent evaluation and awarding process.

In summary, while there is a common thread of ensuring transparency, competitive bidding, and adherence to local laws, the degree of flexibility, the criteria for selection, and the emphasis on economic versus technical aspects vary, reflecting each institution's operational environment and governance structure. Details on procedures conducted for the purpose of equipment procurement in this project for each partner is elaborated in detail in Chapters 4.1 to 4.7.



### 3. The needs for purchasing of laboratory equipment and software in WB countries

#### 3.1 The needs for equipment at UoM and public procurement procedure

The University of Montenegro has identified the urgent need for equipment procurement to address the challenges faced by missing or outdated existing equipment. In particular, the project activities focus on equipping the Laboratory for Materials and Structures at the Faculty of Civil Engineering in Podgorica, with a primary objective of developing curriculum plans and programs centered on sustainable materials.

Considering the available financial resources, the planned equipment is intended for utilization in both the educational process and research activities. It should be applicable for practical exercises in undergraduate and master's programs, with a specific emphasis on courses earmarked for modernization within the project, such as:

Elements of Buildings Course chapters devoted to:

- *Testing Wall Structures*
- *Testing Floor Structures*
- *Thermal Insulation Materials for Buildings*

Construction Materials Course in chapters devoted to:

- *Thermotechnics*
- *Physical-Mechanical Properties of Stone*
- *Physical-Mechanical Properties of Concrete and Mortar*

Based on the defined needs and market research following equipment requested for purchasing in public procurement procedure: 1) Thermal conductivity testing system for determination of characteristics of construction materials 2) Freezing and Thawing testing system 3) Abrasion Testing Machine According to Bohme, in accordance with standards: EN 1338; 1339; 1340; for determining the abrasion resistance of concrete and natural stone products.

In summary, the equipment mentioned will significantly enhance the learning experience for students in the Building Materials and Construction Materials courses. It will enable them to conduct practical experiments, analyze the properties of different materials, and make informed decisions regarding material selection, design optimization, and energy efficiency in construction projects. The acquisition of this equipment is vital to cater to the needs of the University of Montenegro, enabling students and researchers to enhance their knowledge, skills, and practical experience. Upgrading the laboratory facilities will provide a conducive environment for comprehensive learning, research, and experimentation, aligning with the latest advancements in the field. Furthermore, the availability of

modernized equipment will facilitate collaboration with industry partners, fostering the practical application of research findings and contributing to the overall development of the construction sector in Montenegro.

Public procurement procedure is envisaged to purchase the needed equipment. It is defined by the public call that shipping and training in using must be included in price offered by bidder.

The procurement procedure at the UoM required bidders to fulfill the following conditions:

1. Contract execution and delivery of goods within 30 days from the contract signing.
2. Payment term: 30 days from the receipt of a duly issued invoice and signed Receipt Report.
3. Quality control: Goods will be inspected upon delivery to ensure they meet the specified requirements.
4. Warranty: Manufacturer's warranty applies, with any defects addressed within 10 days of notification.
5. Quality guarantee: Goods must be new, unused, and meet the technical specifications provided by the selected bidder.

The deadline for proposal submission via the Montenegro Electronic Public Procurement System (CeJN) was June 14, 2023, at 12:00 PM. The timely and valid proposal was received from **"RBC MEDIA DOOEL " import-export Skopje** on June 13, 2023, at 10:45 AM (proposal code: 65322). No late proposals were received during this procurement procedure. The contract between University of Montenegro, Faculty of Civil Engineering and RBC MEDIA DOOEL was successfully signed on June 26, 2023. The equipment was delivered on November 13, 2023.

### 3.2 The needs for equipment at UNSA and public procurement procedure

As part of the SmartWB project, the University of Sarajevo (UNSA) purchases equipment for the Faculty of Civil Engineering in the Laboratory for Air Quality Monitoring to measure water flow and record water wells. The need for accompanying software for air quality and GIS software for data collection, processing, and analysis was detected. The primary goal is to modernize existing curricula oriented towards sustainable urban development and conservation of water resources.

The equipment can be used for educational purposes as well as research activities. The main purpose of the equipment is to perform exercises in the courses:

Water Protection, Environmental protection, and

Urban roads

On masters study programs, but also to prepare master's thesis. The equipment that will be purchased is underwater inspection HD dual cameras; Ultrasonic flow meter TDS; Device for measuring air pollution with included wind sensor; Davis Instruments Vantage weather station; Software - Davis Instruments and GIS software.

The mentioned equipment will significantly improve the teaching and learning methods of students in the master's study programs: Hydrotechnics and environmental engineering, Geotechnics and Transportation.

It will help students to carry out improved laboratory and in situ tests, analyze different possibilities and supplement their knowledge, and increase competencies and readiness for the labor market. The equipment will enable students and researchers to improve their knowledge, skills, and practical experience. With the equipment, the Faculty of Civil Engineering will provide a suitable environment for comprehensive learning, research and laboratory testing in the field of the latest developments in this field. Also, the equipment will open opportunities for cooperation with the industry.

The Law on Public Procurement of B&H ("Official Gazette of B&H", numbers 39/14 and 59/22) is the basic legal act of the legislation of Bosnia and Herzegovina on public procurement.

The Rulebook on Public Procurement, which regulates internal procedures, conditions, authorizations, and responsibilities in procuring goods, services, and works, was adopted at the University of Sarajevo. The public procurement process is a cycle of operations undertaken by contracting authorities. It consists of 4 basic phases:

- the procurement planning phase,
- the procurement implementation phase,
- contract award phase,
- Contract management phase.

The initiation of the Procurement Plan marks the beginning of the public procurement process, as mandated by Article 17 of the Law on Public Procurement of B&H. This stipulates that procurement can only commence if it is included in the Procurement Plan, which must be published on both the institution's website and the public procurement portal. Following this, the contracting authority formally starts the procurement procedure. At the University of Sarajevo, the rector is responsible for initiating this process and forming a Commission for Public Procurement. This commission, comprising three members and a secretary, handles various tasks including preparing tender documents, overseeing the bid opening, evaluating bids, and recommending the rector on the awarding or cancellation of the procurement. Tender documentation, a crucial part of the process, must adhere to public procurement principles and avoid specifying brands, ensuring a fair and competitive selection process. Additionally, a preliminary market analysis is conducted to estimate the procurement's value and determine the appropriate procurement procedure. For the procurement of goods and services with an estimated value of less than 50,000.00 KM, excluding VAT, a tender request for the delivery of bids is applied.

The contract award criterion can be the lowest price or the most economically advantageous offer. If the criterion is the lowest price, there is an obligation to conduct the e-auction electronically. If the criterion for awarding the contract is the economically most favorable offer.

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the criterion for awarding the contract is the most economically advantageous offer. In that case, it is necessary to define sub-criteria, one of which must be the price, and the others can be: delivery term, payment term, etc.

The tender documentation is published on the public procurement portal, where interested bidders download it. The summary of the procurement notification is also published in the Official Gazette of Bosnia and Herzegovina.

After the public opening of bids and preparation of the Minutes of the opening of bids, an expert evaluation follows. The contracting authority evaluates the bids submitted by qualified bidders, applying the criteria for awarding the contract established in the tender documentation. After the commission has performed all the necessary activities for the professional evaluation of bids and prepared a report on the evaluation of bids, it is obliged to prepare a recommendation to the Rector of the University for deciding on the selection of the most favorable bidder or a decision on canceling the procurement procedure.

The Rector of the University makes the final decision. The selection or cancellation decision is published on the University's website simultaneously as the decision is sent to the bidders who participated in the procurement process. Bidders have the right to appeal the decision in question.

The Law concludes the contract on public procurement on Obligations in B&H, and upon its conclusion, the application of the Law on Public Procurement ceases.

After the completion of the procurement procedure, it is mandatory to publish the contract award notice on the public procurement portal and in the Official Gazette of Bosnia and Herzegovina.

Upon receipt of the goods in question, it is mandatory to draw up a Record of the handover of the goods and to inform the responsible persons at the University so that inventory numbers for the equipment can be assigned. After orderly delivery and a correctly drawn-up invoice, the goods are paid.

B&H laws related to archiving keeps all procurement-related documentation.

The public procurement procedure is defined as competitive. The lowest offer will be accepted. Some specific requirements for the bidders are:

The equipment should be delivered once and within 60 (sixty) calendar days from the date of entry into force of the contract. Payment to the selected bidder will be made after delivery of the goods in question, within 30 (thirty) days from receipt of the tax-correct invoice to the bank account of the bidder submitted in the offer.

The delivery/installation of the software will be performed once and within 45 (forty-five) calendar days from the date of entry into force of the contract. Payment to the selected bidder will be made after delivery of the goods in question, within 30 (thirty) days from receipt of the tax-correct invoice to the bank account of the bidder submitted in the offer.

The warranty period for the delivered equipment cannot be shorter than 12 months.

Quality control: Goods will be inspected upon delivery to ensure they meet the specified requirements.

Quality Guarantee: Goods must be new, unused, and meet the technical specifications provided by the selected bidder.

Due to the fact that we bought various measuring equipment and software, two tenders were announced. The tender has launched for UNSA and UNIBI together and, the first tender had 6 lots, and the second 2 lots.

The public procurement of equipment was launched on December 8, 2023. Procurement was closed on December 27, 2023 at 10:15. The company AMT Metriks d.o.o. applied to us for Lot 1. After the Commission review, the proposal was considered as valid and forwarded for further processing. The contract between University Sarajevo and AMT Metriks d.o.o. was signed on February 28, 2024.

The company EKONERG d.o.o. applied to us for Lot 3. After the Commission review, the proposal was considered as valid and forwarded for further processing. The contract between University Sarajevo and EKONERG d.o.o. was signed on February 23, 2024.

Two companies applied for Lot 4, Nexis d.o.o. and Arhitektengruppe d.o.o. The offer of Nexis d.o.o. is acceptable. The contract with them was signed on March 1, 2024.

The public procurement of software was launched on December 18, 2023. Procurement was closed on January 8, 2024 at 10:05.

For the software for processing data collected with the meteorological station, one proposal was received from Arhitektengruppe d.o.o.. No late bids were received during this procurement process. After the Committee's review, the proposal was deemed valid and forwarded for further processing. Agreement between University Sarajevo and **Arhitektengruppe d.o.o.** was signed on March 13, 2024.

For the GIS software, one proposal was received from JAS d.o.o. No late bids were received during this procurement process. After the Committee's review, the proposal was deemed valid and forwarded for further processing. Agreement between University Sarajevo and **JAS d.o.o.** was signed on March 7, 2024.

### 3.3 The needs for equipment at UNMO and public procurement procedure

Dzemal Bijedic University of Mostar (UNMO) within the SmartWB project is purchasing equipment for the Institute of Faculty of Civil Engineering, in Laboratory for testing of concrete and composites. Laboratory is well equipped for basic testing, but lacks equipment for advanced testing. Primary objective is to modernize existing curricula oriented to sustainable materials.

The equipment can be used for educational purposes, as well as research activities. Main purpose of the equipment is for exercises of courses related to building materials in master study programs, but

also for master thesis. The specific equipment that will be purchased is: 1) Apparatus for detecting reinforcement in concrete 2) Laboratory hammer mill 3) Chamber for simulating climatic conditions.

The listed equipment will significantly enhance teaching and learning methods for students at master study programs in courses:

Durability, resilience and maintenance of structures,

Materials for energy efficient and sustainable buildings,

Special types of concrete,

Sustainable Buildings from natural materials.

It will help students to conduct more enhanced laboratory and in-situ tests, analyze different possibilities of building materials, and to make optimal designs for more energy efficient buildings. The equipment will enable students and researchers to enhance their knowledge, skills, and practical experience. With the equipment, the Institute and the Laboratory for testing of concrete and composites will provide a conducive environment for comprehensive learning, research, and experimentation, aligning with the latest advancements in the field. In addition, the equipment will open possibilities for collaboration with industry.

The Law on Public Procurement of B&H ("Official Gazette of B&H", number: 39/14 and 59/22) is the basic legal act of the legislation of Bosnia and Herzegovina on public procurement.

At the Dzemal Bijedic University of Mostar, the Rulebook on public procurement was adopted, which regulates internal procedures, conditions, authorizations and responsibilities in the procurement of goods, services and works at the Dzemal Bijedic University of Mostar. The public procurement process is a cycle of operations undertaken by contracting authorities and consists of 4 basic phases:

- Procurement planning phase,
- Procurement implementation phase,
- Contract award phase,
- Contract management phase.

The preparation of the Procurement Plan represents the first stage of the public procurement process, because the Law on Public Procurement of B&H in Article 17 defines that the contracting authority can start the public procurement procedure if the procurement is foreseen in the procurement plan. The adopted Procurement Plan must be published on the website and on the public procurement portal ([www.ejn.gov.ba](http://www.ejn.gov.ba)).

After the subject of the procurement is included in the Procurement Plan, the contracting authority initiates the public procurement procedure, making a decision in written form, with mandatory elements defined by law. At the Dzemal Bijedic University of Mostar, the rector makes a decision on

the initiation of the procurement procedure, and a decision on the appointment of the Commission for the implementation of the public procurement procedure in question. The commission mainly consists of 3 members and the secretary of the commission. The tasks of the Commission for Public Procurement are: preparation of tender documentation, conducting the public opening of bids, review and evaluation of bids, drawing up minutes on bid evaluation, giving a recommendation to the rector for making a decision on the selection of the most favorable bidder or a decision on canceling the procurement procedure, and other tasks related to the implementation procurement procedure.

The most important document in any public procurement procedure is the tender documentation. Compliance with the basic principles of public procurement must be ensured through tender documentation, but it is most evident when describing the subject of the procurement, that is, preparing technical specifications. It is necessary to prepare a technical specification on a truly competitive basis, without reference to specific brands.

The preliminary market check and determine the estimated value of the procurement in order to choose the type of procurement procedure.

For the procurement of goods and services with an estimated value below 50,000.00 KM excluding VAT, a competitive request for the delivery of bids is applied.

The criterion for awarding the contract can be the lowest price or the most economically advantageous offer. If the criterion is the lowest price, there is an obligation to conduct the e-auction electronically. If the criterion for awarding the contract is the most economically advantageous offer, it is necessary to define sub-criteria, one of which must be the price, and the others can be delivery term, payment term, etc.

The tender documentation is published on the public procurement portal, from where interested bidders download it. The summary of the procurement notification is also published in the Official Gazette of Bosnia and Herzegovina.

After the public opening of bids and preparation of the Minutes of the opening of bids, there follows an expert evaluation of the bids. The contracting authority evaluates the bids submitted by qualified bidders, applying the criteria for awarding the contract established in the tender documentation. After the commission has performed all the necessary activities for the professional evaluation of bids and prepared a report on the evaluation of bids, it is obliged to prepare a recommendation to the Rector of the University for making a decision on the selection of the most favorable bidder or a decision on canceling the procurement procedure.

The Rector of the University makes the final decision. The selection decision or cancellation decision is published on the University's website, at the same time as the decision is sent to the bidders who participated in the procurement process. Bidders have the right to appeal the decision in question.

The contract on public procurement is concluded in accordance with the Law on Obligations in B&H, and upon its conclusion, the application of the Law on Public Procurement ceases.

After the completion of the procurement procedure, it is mandatory to publish the contract award notice on the public procurement portal and in the Official Gazette of Bosnia and Herzegovina.

Upon receipt of the goods in question, it is mandatory to draw up a Record of the handover of the goods, and to inform the responsible persons at the University so that inventory numbers for the equipment can be assigned. After orderly delivery and a correctly drawn up invoice, payment for the goods is made.

All procurement-related documentation is kept in accordance with B&H laws related to archiving.

Public procurement procedure is defined as competitive. The lowest offer will be accepted. Some specific requirements for the bidders are:

1. Delivery of the equipment should be within 60 days after signing the contract
2. Payment: 15 days after the duly issued invoice and signed Receipt Report
3. The warranty period for the delivered equipment cannot be shorter than 12 months
4. Quality control: Goods will be inspected upon delivery to meet the specified requirements
5. Quality guarantee: Goods must be new, unused, and meet the technical specifications provided by the selected bidder.

The public procurement was launched on September 21, 2023. Procurement was closed on October 5, 2023. At 10:00 one proposal was received from RO-Tehnologija d.o.o. No late proposals were received during this procurement procedure. After the Commission review, the proposal was considered as valid and forwarded for further processing. The contract between Dzemal Bijedic University of Mostar and **RO-Tehnologija d.o.o.** was signed on October 13, 2023. The equipment was delivered on January 31, 2024.

### 3.4 The needs for equipment at UNBI and public procurement procedure

As part of the SmartWB project, the University of Bihać (UNBI) purchases equipment for the Faculty of Technical Engineering in the Laboratory for concrete testing, air quality-monitoring, pressure, thermal, lux measurement, and measurements in mechanics. We also purchased accompanying software for air quality and GIS software for data collection, processing, and analysis. The primary goal is to modernize existing curricula oriented towards sustainable urban development, energy efficiency building and Spatial Planning.

The equipment can be used for educational purposes as well as research activities. The main purpose of the equipment is to perform exercises in the subject of:

Building Materials.



### Energy Efficiency, and

### Spatial Planning

in master's study programs and bachelor study programs, but also to prepare a master's thesis. The equipment that will be purchased is a sclerometer; Weather station; equipment for measurement of pressure, thermal camera, luxmeter; Gauge with clip for measurements in fracture mechanics; and linear potentiometer. Software - Davis Instruments and GIS software.

The mentioned equipment will significantly improve students' teaching and learning methods in the master's study programs.

It will help students to carry out improved laboratory and in situ tests, analyze different possibilities supplement their knowledge, and increase competencies and readiness for the labor market. The equipment will enable students and researchers to improve their knowledge, skills, and practical experience. With the equipment, the Faculty of Civil Engineering will provide a suitable environment for comprehensive learning, research, and experimentation with the latest developments in this field. Also, the equipment will open opportunities for cooperation with the industry.

The Law on Public Procurement of B&H, detailed in the "Official Gazette of B&H" numbers 39/14 and 59/22, governs Bosnia and Herzegovina's public procurement procedures. The University of Sarajevo follows these guidelines (since UNSA was also the responsible Institution for purchasing the equipment for UNBI), encapsulated in the Public Procurement Rulebook, which outlines the procurement cycle's four phases: planning, implementation, awarding, and management.

The process starts with drafting a Procurement Plan, a requirement before initiating procurement, as per Article 17 of the Law. This plan, once formulated, is public. The University's rector then greenlights the procurement process, appointing a commission responsible for tender documentation, bid evaluation, and recommendation for awarding or cancellation of the tender.

Tender documentation, central to the process, ensures compliance with procurement principles, requiring non-brand-specific technical specifications. It precedes a market check to determine the estimated value and type of procurement procedure, catering to procurements under 50,000 KM, excluding VAT, with distinct criteria for awarding contracts based on price or the most economically advantageous offer, necessitating electronic auctions or the definition of sub-criteria, respectively.

Following the bid opening and evaluation, the University's rector decides on the award, with the decision published online. Successful completion of the procedure includes public announcement of the award, goods receipt, payment to the bidder, and archival of documentation in accordance with B&H laws. The procedure, competitive by nature, mandates delivery within 60 days and payment within 30 days post-receipt, with a warranty period of at least 12 months for the delivered equipment or software. The warranty period for the delivered equipment cannot be shorter than 12 months.

Quality control: Goods will be inspected upon delivery to ensure they meet the specified requirements.

Quality Guarantee: Goods must be new, unused, and meet the technical specifications provided by the selected bidder.

The public procurement of equipment was launched on December 8, 2023. Procurement was closed on December 27, 2023 at 10:15.

The company RO-Tehnologija d.o.o. applied to us for Lot 2. After the Commission review, the proposal was considered as valid and forwarded for further processing. The contract between University of Bihać and RO-Tehnologija d.o.o, was signed on March 11, 2024.

The company Arhitektengruppe d.o.o. and MPS LAB d.o.o. applied to us for Lot 5. After the Commission's review, the proposal of Arhitektengruppe d.o.o. was assessed as incomplete, so this offer was rejected. Offer of the company MPS LAB d.o.o. was evaluated by the Commission as valid and forwarded for further processing. Agreement between the University of Bihać and MPS LAB d.o.o. signed 07.03.2024.

The company Nexis d.o.o. and TRC PRO d.o.o. applied to us for Lot 6. After the Commission's review, the proposal of TRC PRO d.o.o. was assessed as incomplete, so this offer was rejected. Offer of the company Nexis d.o.o. was evaluated by the Commission as valid and forwarded for further processing. Agreement between the University of Bihać and Nexis d.o.o. signed on March 11, 2024.

The public procurement of software was launched on December 18, 2023. Procurement was closed on January 8, 2024 at 10:05.

For the software for processing data collected with the meteorological station, one proposal was received from Arhitektengruppe d.o.o. No late bids were received during this procurement process. After the Committee's review, the proposal was deemed valid and forwarded for further processing. Agreement between University Bihać and Arhitektengruppe d.o.o. was signed on March 13, 2024.

For the GIS software, one proposal was received from JAS d.o.o. No late bids were received during this procurement process. After the Committee's review, the proposal was deemed valid and forwarded for further processing. Agreement between University Bihać and JAS d.o.o. was signed on March 7, 2024.

### 3.5 The needs for equipment at UET and public procurement procedure

Within the scope of the SmartWB project, the European University of Tirana has recognized a pressing need to procure equipment, based on the courses slated for modernization, to facilitate problem-based teaching initiatives. The purchased equipment is planed to be used in filed of

Construction Sciences,

Urban Design and

Architecture Technology.

Following equipment is planned to be purchased:

- 1) U value measurement items: (Thermohygrometer, Temperature Probe for U-Value Measurement, 3 Sensors n Humidity/temperature probes, Protective case for equipment)
- 2) Anemometers: Testo 417 - Vane Anemometer (Set 1), Pocket-sized thermal anemometer
- 3) Tachometers: Testo 465 - Non Contact Tachometer
- 4) Blower Door: Smoke Pencil Pro Field Kit with Case
- 5) Software to process images to produce 3D spatial data
- 6) MATLAB
- 7) Plagiarism check software.

Being a private university, the European University of Tirana (UET) operates under a different regulatory framework than public institutions, in terms of procurement. UET has their own procurement policies, designed to meet their operational needs while ensuring efficiency and effectiveness in their spending. Reflecting this flexibility, UET proceeded with the acquisition of its required equipment through direct purchasing on the market, without engaging in any bidding processes. This approach enabled the university to efficiently meet its specific needs and operational requirements in a timely manner.

### 3.6 The needs for equipment at UPT and public procurement procedure

In the framework of the SmartWB project, UPT based on the list of the courses that will be modernized, has identified the need for equipment to be in use for educational processes and research activities. The equipment should be applicable in practical exercises on the listed modernized courses as mentioned below:

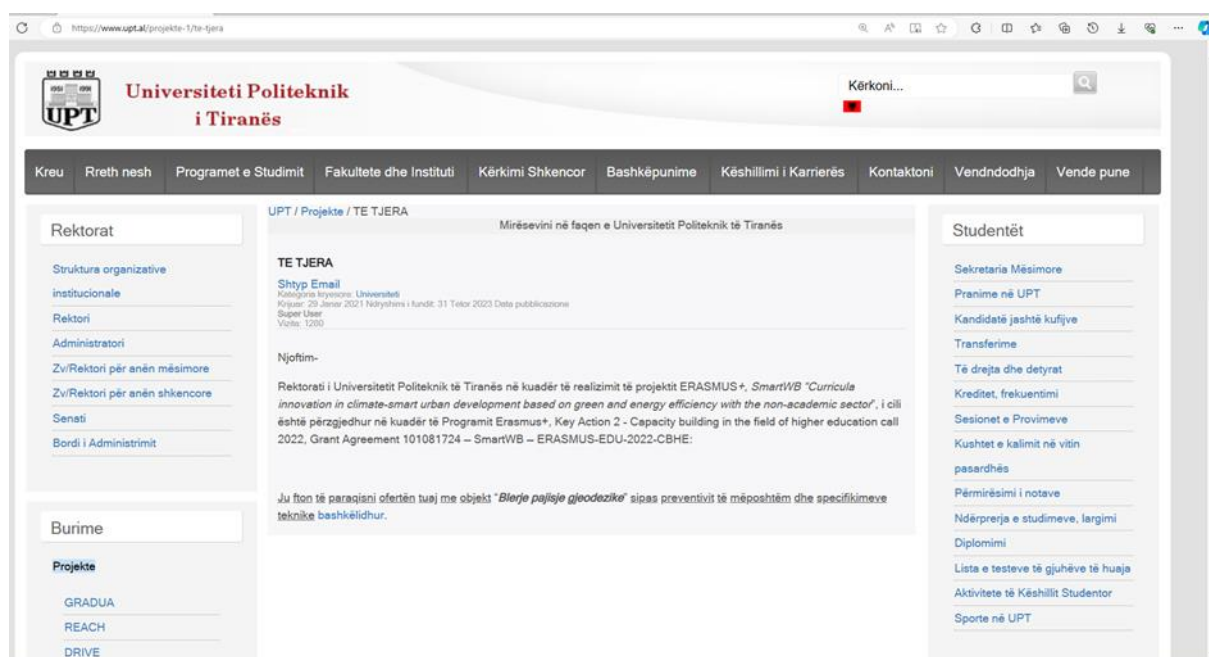
<u>General Geodesy 1</u> (6 ECTS)	Bachelor < 20% 55 students.
<u>General Geodesy 2</u> (7.5 ECTS)	Bachelor < 20% 55 students.
<u>Topographic Surveying and State Geodetic Networks 1</u> (6 ECTS)	Bachelor < 20% 55 students
<u>Topographic Surveying and State Geodetic Networks 2</u> (7.5 ECTS)	Bachelor < 20% 55 students
<u>Knowledge of urban planning and projects</u> (4 ECTS)	Master of Science + Professional Master < 20% 39 (MSG) + 18 (MPG) students.

After evaluating the needs, it is established that geodetic equipment (TOTAL STATIONS) should be purchased through this call.

The coordinator of UPT has addressed to the Administrator of the UPT Rectorate a request for the opening of the procurement procedure for the purchase of geodetic equipment (TOTAL STATION) (Date September 21, 2023) with a limit fund of 20,000 Euros (without VAT) according to the equipment specifications, as well as supplementary requests.

Following the Faculty of Civil Engineering's request (No. 596 dated October 3, 2023) and the order to purchase geodetic equipment using SmartWB funds (Order No. 4 dated October 27, 2023), the UPT Rectorate's Directorate of Services, Investments, and Maintenance initiated the formation of a commission (Commission No. 2506/1 Prot. dated October 27, 2023) to oversee and evaluate the procurement process.

The *tendering procedure invitation has been announced* with all the necessary information (the equipment technical specifications, the documents that must be completed and deadline for submission of tender) *on the official website of the UPT Rectorate* on October 30, 2023: <https://www.upt.al/projekte-1/te-tjera>.



As long as the available fund of 20,000 Euros was less than 25,000 Euros, based on the legislation in force, *the tendering procedure has been announced/published for 10 days*.

Three tenderers/bidders have submitted all the required documents enclosed envelopes on the day of the tender opening, *date 10/11/2023 at 11:00, at the UPT Rectorate, "Mother Teresa" Square, second floor, Procurement Sector/Unit*:

1. Geo Tech ShPK, NIPT K91923003D, Offer without VAT 19,700.00 Euro, Offer with VAT 23,640.00 Euro.
2. MCE ShPK, NIPT L72203065K, Offer without VAT 19,500.00 Euro, Offer with VAT 23,400.00 Euro.
3. GeoPoint-al ShPK, NIPT L31615004D, Offer without VAT 19,860 Euro, Offer with VAT 23,832.00 Euro.

On November 15, 2023, after careful examination and assessment of the bids for the "Purchase of Geodetic Equipment" tender, the Bid Evaluation Commission recommended GEO TECH ShPK as the successful bidder to the contracting authority's lead. The bid was valued at €19,700 (without VAT), equivalent to 2,082,585 Albanian Lek (ALL), excluding VAT.

On 24.11.2023, after reviewing and verifying the documentation of the economic operators, the legal, financial and technical capacities, the Bid Evaluation Commission upon completion of the verification and control for arithmetic errors of the winning economic bid, decided the final ranking as below:

1. "GeoTech" ShPK with an economic offer of 19,700 (nineteen thousand seven hundred) Euro (without VAT) or the equivalent of 2,082,585 (two million eighty-two thousand five hundred and eighty-five) ALL without VAT.

The following bidders were disqualified, respectively for the following reasons:

- "MCE" ShPK with an economic offer of 19,500 Euro without VAT.

- It does not meet the Criterion defined in the Invitation for Tenders point 2.3.1 as it has not presented evidence for previous similar supplies, carried out during the last three years from the date of the announcement of the contract notice, in a value not less than 40% of the limit fund of this contract.

- It does not meet the Criterion defined in the Invitation to Offer point 2.3.3 as it has not submitted a manufacturer's authorization, or a cooperation agreement with the manufacturer, or a distributor's authorization for the equipment subject to procurement.

- It does not fulfill the Criterion defined in the Invitation to Tender point 2.3.4 as it has not presented photographs/catalogs/brochures or fragments (pages) of the catalog/s for the equipment subject to procurement, clearly and distinctly marking the equipment it offers.

- It does not meet the criteria defined in the Invitation to Tender point 2.3.5, as it has not submitted the required documentation to prove that it has employed a Geodetic Engineer certified by the manufacturer to carry out the installation, service of the equipment and training of the processing software / the terrain.

- It does not meet the Criterion defined in the Invitation for Offers point 2/a as it has not submitted the offer insurance according to Appendix 3.

- "Geo Point-AI" ShPK with an economic offer of 19,860 Euro without VAT.

- It does not meet the Criterion defined in the Invitation to Offer point 2.3.3 as it has not submitted a manufacturer's authorization, or a cooperation agreement with the manufacturer, or a distributor's authorization for the equipment subject to procurement.

- It does not fulfill the Criterion defined in the Invitation to Tender point 2.3.4 as it has not presented photographs/catalogs/brochures or fragments (pages) of the catalog/s for the equipment subject to procurement, clearly and distinctly marking the equipment it offers.

On November 30, 2023, the Bid Evaluation Commission announced the GEOTECH" sh.p.k. as the winner of the "Purchase of geodetic equipment" tendering procedure with a fund of 19,700 (nineteen thousand seven hundred) Euro (without VAT) or the equivalent of 2,082,585 (two million eighty-two thousand five hundred and eighty-five) ALL without VAT.

On November 11, 2023, POLYTECHNIC UNIVERSITY OF TIRANA, represented by the Head of the Contracting Authority Mr. Besmir ALI and "GEOTECH" ShPK, represented by the ADMINISTRATOR, Mr. Eljon PEKA, signed the SALE-PURCHASE CONTRACT of geodetic equipment.

The goods, object of this contract, have been delivered by the Contractor to the warehouse of the Contracting Authority, within the time limit of 60 work- days after the date of signing the accompanying contract.

After the Contracting Authority (Purchaser) has performed the controls for the goods subject to the contract,

- A special commission has been set up by order of the Administrator of the Faculty of Civil Engineering.
- The equipment has been registered in the inventory register of the Department of Geodesy, Faculty of Civil Engineering, UPT.
- FCE UPT Team organized the handover ceremony of the geodetic equipment from the GEOTECH Ltd, purchased with the funds of the SmartWB project, with the participation of Master of Science in Geodesy students, colleagues of the Department of Geodesy and the Administrator of FCE, as well as
- Photos of the equipment required with the Erasmus+ labels provided.

### 3.7 The needs for equipment at U\_POLIS and public procurement procedure

On the framework of the SmartWB project, the Faculty of Urban Planning at Polis University based on the list of the courses that will be modernized, has identified the urgent need for equipment procurement to address some problem-based teaching projects that they want to deliver in particular in the "Urban Planning" studio. The equipment is intended to be in use for educational processes and research activities.

The equipment should be applicable in practical exercises on the following modernized courses:

Urban Economics,

Local Governance,

Urban planning studio and

### Geographic Information systems

The requested equipment list that is linked to the courses that we modernized are such as Indoor/ Outdoor 3D Scanner/ Teodolit and Drone, with a total price of 20000 Euro.

POLIS University, as the contracting authority, has published the tender invitation on its official website. The announcement of the tender, with all the necessary information on the procurement procedure, as well as the documents that must be completed by the tenderer, were made public on April 20, 2023. The link of the call: <https://universitetipolis.edu.al/invitation-to-tender-smartwb/>

Through the document of "Instruction to Tenderers", bidders fully and unreservedly accept the special and general conditions governing the contract as the sole basis of this tendering procedure. Tenderers must carefully review and comply with all instructions, forms, contract provisions and specifications contained in this tender dossier. Failure to submit a tender containing all the required information and documentation within the stipulated time, will lead to the rejection of the tender. No remark in the tender regarding the tender file can be taken into account. Objections may result in the immediate rejection of the tender without further evaluation.

In this document, the technical specifications, and the required amount of equipment, regarding the supply contract from the contractor, POLIS University, are defined. The tender process is outlined with key dates: submission and opening of tenders on May 22, 2023 at 11:00, notification of the award on June 5, 2023, and contract signing scheduled for 19.06.2023.

This document also explains the rules of participation, the declaration regarding the country of origin of the goods, the period of validity of the tender, the content of the tender (the technical specifications provided, the financial offer, the tender guarantee, which is 1% of the budget available for the contract) and the way to withdraw from the tender.

During the completion of the tender documents, the tenderers refer to the Specific and General Terms and Conditions of the tender.

On May 22, 2023, the tenderers/bidders submitted their proposals in sealed envelopes for evaluation by the designated committee. The documentation included a financial offer (budget breakdown), proof of the bidding company's legal entity, a security offer amounting to 1% of the contract's budget, technical specifications alongside a comparative technical offer, and the tender form filled out with the bidder's details. The announcement for the day of the bid opening was made through the "Nomination of the Evaluation Committee", a document which contains the opening date of the offers (May 22, 2023), the supply object of the contract together with no. of the project reference, a brief description of the supply contract, as well as the composition of the evaluation commission (members of the commission). In the bid opening session, the documents submitted by the tenderers in the envelope are evaluated by the evaluation commission set up for this purpose, which completes the data below for the three bidders who participated in this call for tender.

For the tender at POLIS University, an Evaluation Committee comprising five members was established to oversee the process. The tender opening took place on May 22, 2023, at 11:00, within the

university's facilities. The committee began by utilizing the administrative compliance grid from the tender dossier to verify each tender's adherence to the administrative prerequisites. This preliminary assessment found that all tenders from the three companies—GEOTRIM sh.p.k, IFD Tech sh.p.k, and ITEAM sh.p.k (Fatjon Vasili PF)—were administratively compliant, submitted at 09:00, 09:30, and 10:00 respectively.

Subsequently, the committee applied the technical evaluation grid to examine the tenders against the technical requirements. After thorough discussions, it was concluded that all tenders met these technical specifications as well. The financial offers were then reviewed, revealing GEOTRIM sh.p.k's bid at €15,500, IFD Tech sh.p.k's at €17,000, and ITEAM sh.p.k's at €17,500. No arithmetic errors were found in the technically compliant tenders.

Upon verifying the documentary evidence for exclusion and selection criteria for the tender with the highest overall scores, the Evaluation Committee recommended awarding the contract to GEOTRIM sh.p.k, with the most competitive financial offer of €15,500, identical to the contract value.

The contract formalization with GEOTRIM sh.p.k occurred on June 19, 2023. Following the completion of this tendering procedure, the equipment was successfully delivered to POLIS University.

After the finalization of the tendering procedure as foreseen the equipment are at POLIS University.



## 4. The purpose of purchased the equipment

### 4.1 The purpose of purchased the equipment at UoM

The purpose of equipment procurement at the University of Montenegro, specifically for the Laboratory for Materials and Structures at the Faculty of Civil Engineering in Podgorica, is multifaceted. The primary objective is to support the development of curriculum plans and programs that focus on sustainable materials, aligning with the University's vision for high-quality education.

The planned equipment, based on the available financial resources, will serve a dual purpose in both the educational and research domains. It will facilitate practical exercises in undergraduate and master's courses, with a particular emphasis on subjects targeted for modernization within the project. The equipment selection includes:

1. Thermal conductivity testing system for determination of characteristics of construction materials

- 1.1 Portable thermal conductivity meter suitable to connect and automatically recognize different probes for implementation to different materials: liquids, solids, pastes, and powders.

- 1.2 Probe for testing Solid Materials, Polymers and Composites.

Measurement Capabilities in minimum range 0.05 to 5 W/mK

Thermal Conductivity of Bulk Properties

Measurement Time in maximum 30 seconds

Reproducibility less or equal to 2%

Accuracy equal or better than 5%

Temperature Range minimum 10 to 40°C

Minimum Sample Size 35 mm diameter or square

Maximum Sample Size Unlimited

Test Method Transient Plane Source (TPS)

- 1.3 Probe with 50 mm needle for testing in concrete, bitumen, stone, etc. in sample with inserting in drilled hole.

Used for Materials Concrete, Rock, and Polymers

Measurement Capabilities: Bulk Properties

Thermal Conductivity in minimum range 0.5 to 5 W/mK

Thermal Resistivity minimum range 0.3 to 3.3 mK/W

Measurement Time less or equal to 3 min.

Reproducibility less or equal to 2%

Accuracy better or equal to 5%

Temperature Range minimum -40 to 100°C

For samples bigger than 50 mm in length, 50 mm diameter

Standard: Modified ASTM D5334-22

## 2. Freezing and thawing testing system

2.1 Freezing and Thawing Chamber, minimum capacity 500 L, Freezing and Thawing in Air in Water related to standards: EN 12390-9; 1338, 1339, 1340, 1367-6, 13748-2;

Minimum range: -30 to 65°C. Control system can define a program of minimum 15 steps adjusted in different time for every step according to requested Standards. Must have refrigeration and heating unit, door, stainless steel interior, fan circulated. Supplied with minimum 3 pcs. adjustable shelves software. Power supply 220-240V, 50-60Hz, 1ph.

Distribution and homogeneity of temperature in the cabinets performed with integral fan. Accuracy of cabin temperature distribution to be lower than 2°C.

The control unit needs to be equipped with a digital display with 0.1°C temperature resolution. The temperature is controlled by movable cabled sensor which can be immersed either into the sample, or into the water which the sample is placed into or into the salty water solution placed on the sample before starting the test. Possibility of sensor calibration from controller by user.

The user can preset the time and target temperature of each ramp and the number of each set by using the control unit.

2.2 PC software for Freezing and thawing test for data transfer from Climatic chamber and real-time monitoring on the computer. Data to be possible to convert to an excel report or equivalent also to a graph.

## 3. Abrasion Testing Machine According to Bohme, in accordance with standards: EN 1338; 1339; 1340; for determining the abrasion resistance of concrete and natural stone products.

Accuracy of the rotation speed  $30 \pm 1$  rpm. Must stops automatically after 22 rotation,

To have digital rotation indicator,

Rotation plate of minimum Ø750mm.

To have removable testing weight of 30 kg and a clamping device for the sample

Abrasive sand should be ordered separately.

220-240V, 50Hz, 1ph

This equipment will be used as follow:

In Elements of Buildings Course:

- *Testing Wall Structures:* The thermal conductivity testing device will enable students to analyze and evaluate the thermal performance of different wall structures. By measuring the thermal conductivity of materials used in wall construction, such as insulation materials, students can assess their effectiveness in providing thermal insulation and optimize energy efficiency in building design.
- *Testing Floor Structures:* The thermal conductivity testing device can also be utilized to evaluate the thermal properties of floor structures. Students will be able to measure the thermal conductivity of different flooring materials, helping them understand the impact of various materials on heat transfer and energy consumption within buildings.
- *Thermal Insulation Materials for Buildings:* The equipment, specifically the thermal conductivity testing device and the freezing and thawing testing system, will allow students to assess the thermal properties and performance of different insulation materials. This analysis will aid in selecting appropriate insulation materials that effectively reduce heat transfer and improve energy efficiency in buildings.

In Construction Materials Course:

3. *Thermotechnics:* The thermal conductivity testing device, with its range of probes and measurement capabilities, will enable students to investigate the thermal conductive properties of various construction materials. This knowledge will be crucial in understanding heat transfer mechanisms and designing energy-efficient building systems.
4. *Physical-Mechanical Properties of Stone:* The thermal conductivity testing device, along with additional equipment mentioned, can be used to determine the physical-mechanical properties of different types of stones. Students will have the opportunity to evaluate parameters such as thermal conductivity, density, and compressive strength, providing valuable insights for material selection and structural design in stone-based construction projects.
5. *Physical-Mechanical Properties of Concrete and Mortar:* The Bohme's device for abrasion testing will allow students to assess the resistance to wear of concrete and natural stone products. By measuring the rate of rotation and observing the wear on the test specimens,

students can evaluate the durability and quality of concrete and stone materials commonly used in construction.

## 4.2 The purpose of purchased the equipment at UNSA

The equipment acquired through the project will be used primarily for teaching and educational purposes, and for the needs of research projects. In accordance with the changes in teaching syllabi created as part of the Erasmus+ SmartWB project, the equipment will primarily be used for teaching subjects: Environment Engineering, Water Protection and Urban roads.

Equipment includes:

### 1. Underwater inspection HD dual camera system V8-BCS-200 m

This camera is used for underwater recording of wells, drains, pipelines and the like. Characteristics are: Dia.45mm dual view (side/down) rotating camera head. Pan 360° rotation, waterproof 30bar, 1/3 CMOS, 1.3MP pixel HD camera sensor, 8 inch IPS LCD screen, resolution 1280\*720

DVR control box with audio, video and photo recording function 200m Dia.8mm flexible cable, USB wireless keyboard for typing words. The video resolution of the camera is 720P. Built-in 10500mA li-ion battery, supports operation for more than 5 hours. Digital counter function, the error is less than 1%

### 2. Ultrasonic flow meter

Ultrasonic flow meters are inferential meters that use ultrasonic technology to measure the velocity of an acoustically conductive liquid moving through it. The characteristics of the equipment are: Portable measuring control devices, Display 4x 16 LCD Accuracy: 1% of measurement. Resolution: 0.0001 m/s Measuring range: 0.01 to 30 m/s. Medium: All liquids, Data logger: 2000 units of measurement. 1 x Ultrasonic flow meter, 2 x electro-acoustic transducer, 2X5 m cable, 2 x chain, 3 x AAA Ni-H batteries, 1 x charger, 1 x electrode, 1 x measuring tape, 1 aluminum case, 1 x manual

### 3. Meteorological station

A meteorological station comprises key components for monitoring weather conditions in a specific area. The console, functioning as the central control, facilitates data display, analysis, and tracking. The power adapter ensures continuous operation. The sensor unit, housing a rain gauge, temperature and humidity sensors, and a wind speed meter, measures precipitation, monitors atmospheric conditions, and records wind speed. A transmitter enables wireless data transmission from the station to the console or other devices, allowing remote monitoring. Positioned in the desired location, the station's outdoor sensor unit ensures accurate data recording. These stations serve research purposes and monitor weather conditions in diverse settings, from agricultural areas to urban environments.

4. Scan grip Stand-Tripod, reflector stand for the construction site. The characteristics are: Tripod length (max.) 3000mm, Tripod length (min.) 1350mm, Weight: max. 6000g

5. Polludrone air pollution measuring device

A device that integrates all the sensors for measuring the following air pollution parameters: PM1, PM2.5, PM10, PM100, CO, CO<sub>2</sub>, SO<sub>2</sub>, NO, NO<sub>2</sub>, O<sub>3</sub>, Power supply: 220-230 V AC Waterproof housing, Data transmission: GSM (2G/3G), LTE, Wi-Fi, and Ethernet

6. Software for processing data collected by a meteorological station

The software is designed for processing data collected by a meteorological station.

7. Software: GIS desktop application

The GIS software is a versatile desktop application supporting various data types (Spatial, 3D, BIM, photogrammetry). It facilitates data viewing, editing, conversion, and provides tools for topological processing, spatial, and traffic analyses. Beyond that, it supports object network analysis, nautical charts, 3D effects, and integrates artificial intelligence for video data, scene classification, object detection, and Cloud services.

This equipment will be used in the following courses:

In course Environmental Protection:

For Practical / Problem solving, students will use uPerMap GIS software for concrete - key study. Their activity will include the specific application of software to the collection and the analysis of data related to environmental impact assessment.

In course Water protection:

- For the purposes of studying changes that occur in water supply systems, such as, for example, collimation of wells and drains (reduction of the inflow into the well and drains due to the closing of the drainage holes), students will have the opportunity, with the professional help of experts from water supply companies, to record underwater wells or wells that are out of order, which can serve as an example for students. In this example, they will see the need for remediation.
- In parallel with these activities, they will record the flow through water systems using an Ultrasonic flow meter.

In course Urban Roads:

- Through practical field exercises with the Polludrone air pollution-measuring device, students will collect and analyze data on traffic-related air pollution at specific locations. They will identify pollutant types, measure and gather data, and simulate traffic flow to assess pollution

levels. Additionally, they will explore strategies to mitigate air pollution, such as design modifications, enhancing public transportation, and implementing public policies.

- In addition, users of the weather station will be able to monitor basic climatological parameters at selected locations and specifically link them with data from the previous device. The collection and processing of this data will be done through software, which was also purchased for this purpose.
- Scan grip Stand-Tripod, reflector stands for the construction site, which will be used to place the above-mentioned devices on the construction site.

### 4.3 The purpose of purchased the equipment at UNMO

The purpose of procured equipment at Dzemal Bijedic University of Mostar, i.e. Institute of Faculty of Civil Engineering is in two directions. On the one hand, the equipment is intended to be used for education purposes, in line with the curricula and University's green oriented plans. On the other hand, the equipment can be used for research related education in the field of the civil engineering and sustainable development.

The equipment includes:

#### 1. Apparatus for detecting reinforcement in concrete (Surface scanner)

The equipment is used to measure the protective layer of concrete structures and detect reinforcing bars and other metals in concrete. The equipment should locate rebars, measure bar diameter and orientation. The equipment consists of:

Head for scanning the concrete surface

The possibility of detecting bars with a diameter of up to 40 mm up to a minimum depth of 90 mm, with a diameter of up to 8 mm up to a minimum depth of 60 mm

The possibility of connecting to a PC

Included calibration block with certificate

Lithium ion battery for a minimum of 30 hours of continuous use, with charger

In compliance with standard BS 1881:204

#### 2. Laboratory hammer mill

The equipment is used for shredding samples of various materials previously shredded to a size greater than 4mm. The equipment can shred materials to 1 mm size particles.

Voltage and frequency: 380 V, 50-60 Hz, three-phase

Power up to 500 W

Hardness of the material processed: up to a maximum of 7 Moh

Size of the grinding drum minimum 170 mm

Capacity: minimum 45 kg/h

Sieves for mill sizes: 1 mm, 2 mm and 4 mm

### 3. Chamber for simulating climatic conditions

The equipment is used to simulate climatic conditions (humidity, temperature and carbon dioxide), to test the carbonation of samples of various materials for stability testing according to ICH - VHO - EMA - ASEAN- GMP - GLP - GCCP.

The equipment contains:

- Temperature range: minimum -10°C to maximum +60°C
- Ability to adjust humidity: minimum 10% to maximum 80%
- Air ventilation in the chamber from a minimum of 10% to 100%
- Calibration certificate for a minimum of +10°C and +37°C, a minimum of 60% humidity at +30°C
- Software on a USB stick for programming, management and transfer of programs via Ethernet interface or USB port
- Volume minimum 100 l, up to maximum 110 l
- Internal space minimum 550 mm
- The possibility of testing a minimum of 140 kg of samples
- Digital timer adjustable from 1 minute to 99 days
- The process time does not start until the set temperature is reached
- Highly efficient automatic defrosting system
- Voltage and frequency: 230 V, 50/60 Hz
- Power up to 1400 W

The equipment will be used for:

In course Durability, resilience and maintenance of structures:

- For case-studies students master all the steps in the building's condition diagnosis, and with apparatus for detecting reinforcement in concrete they can accurately estimate construction conditions in the field.
- For case-studies students will be able to assess long-term materials performance needed for reconstruction or remediation by using a chamber for simulating climatic conditions. This will help in educating the students to choose the right materials in line with sustainable development.

In course Materials for energy efficient and sustainable buildings:

- The students will be introduced to the research of climate change and pollution effect on traditional and modern building materials. The research includes the impact of temperature changes, moisture and pollution with CO<sub>2</sub> on building materials such as stone, wood, ceramic materials and concrete. For this purpose, a chamber for simulating climatic conditions is essential.
- Based on the previously mentioned, we would introduce materials with enhanced properties for modern urban environments, where we can use apparatus for detecting reinforcement in concrete (surface scanner) and laboratory hammer mill for grinding additives to composite materials.

In course, Special types of concrete:

- We will improve the curricula by introducing modern research on the topic of concrete modified with various types of waste materials as supplementary cementitious materials or supplementary aggregate materials. For this purpose the essential equipment is laboratory hammer mill and chamber for simulating climatic conditions.
- The students will be able to learn in more detail special types of concrete which can meet the modern requirements in urban development, and to transfer knowledge in practical examples with apparatus for detecting reinforcement in concrete.

In course Sustainable buildings from natural materials:

- We will improve the curricula and change the name of the course to Sustainable building materials, where various topics in new and sustainable materials will be introduced. Sustainable materials is top research field in construction industry and especially in the field of environmental protection and sustainable buildings, where laboratory hammer mill and chamber for simulating climatic conditions will be used.
- In addition, the listed equipment will be used for research purposes in the field of sustainable materials and energy efficiency.

#### 4.4 The purpose of purchased the equipment at UNBI

The purpose of acquiring equipment at the Faculty of Technical Engineering, specifically the Department of Civil Engineering and the Institute of Civil Engineering, encompasses a dual dimension.



Primarily, the equipment is designed for use in educational settings, aligned with the academic curricula and the university's environmentally conscious initiatives. On the other hand, the same equipment provides opportunities for utilization in scientific research, particularly in the highly relevant field of sustainable development within the construction industry. The equipment includes a comprehensive array of sophisticated tools and state-of-the-art machinery, encompassing cutting-edge technologies tailored to meet the demands of both academic instruction and advanced research initiatives within the realm of civil engineering:

#### 1. Schmidt Hammer (sclerometer for testing concrete)

The equipment, including the Schmidt Hammer (sclerometer for testing concrete), is utilized in the analysis of concrete strength. This device operates with an impact energy of 2.207 Nm and boasts a wide measurement range from 5 to 120 N/mm<sup>2</sup>. Additionally, the Schmidt Hammer complies with pertinent standards, such as EN 12 504-2 and BS EN 13791. In practical terms, this instrument is employed to measure the hardness of concrete surfaces through impact, providing valuable data on material strength. With its precision and adherence to industry standards, the Schmidt Hammer becomes a crucial tool for both educational purposes at the university and research activities in the field of civil engineering.

#### 2. Meteorological station

A meteorological station comprises key components for monitoring weather conditions in a specific area. The console, functioning as the central control, facilitates data display, analysis, and tracking. The power adapter ensures continuous operation. The sensor unit, housing a rain gauge, temperature and humidity sensors, and a wind speed meter, measures precipitation, monitors atmospheric conditions, and records wind speed. A transmitter enables wireless data transmission from the station to the console or other devices, allowing remote monitoring. Positioned in the desired location, the station's outdoor sensor unit ensures accurate data recording. These stations serve research purposes and monitor weather conditions in diverse settings, from agricultural areas to urban environments.

#### 3. Software for processing data collected by a meteorological station

The software is designed for processing data collected by a meteorological station.

#### 4. Construction Site Floodlight Stand

The construction site floodlight stand allows for adjustable placement of floodlights at various heights, with a pole length ranging from 1350 mm to 3000 mm. The maximum weight capacity of the stand is 6000 g. This equipment is used to ensure adequate lighting on construction sites, enhancing working conditions, particularly during nighttime.

#### 5. Pressure Gauge

The probe-free pressure gauge is a device designed for measuring various environmental parameters without the requirement for additional probes. Here's a concise overview of its use:

- This gauge measures air pressure, illumination, CO2 concentration, temperature, and wind speed.

Air pressure measurement range: -150 to +150 hPa.

This gauge is employed to monitor atmospheric parameters in diverse environments. It enables quick and accurate measurement of air pressure, illumination, CO2 concentration, temperature, and wind speed without the need for extra probes. It finds applications in meteorology, scientific research, building energy efficiency, and other fields where monitoring environmental quality is essential.

## 6. Thermal camera

Thermal camera (320 x 240 pixels, manual focus, application, laser) with standard (30° x 23°) and telephoto (12° x 9°) lenses. It comes with a USB network unit, Li-ion rechargeable battery, spare battery and battery charging station with USB cable, carrying strap, calibration protocol, and a tripod. Applications: Industrial Sector: Monitors thermal characteristics of machinery, electrical installations, and identifies overheating or irregularities, Construction Industry: Identifies thermal leaks, assesses insulation, and detects heat loss, Building Maintenance: Inspects heating, ventilation, and air conditioning systems and detects insulation issues.

The camera's features, including manual focus, application integration, and a laser, enhance precision and adaptability.

## 7. Wall surface temperature sensor

The wall surface temperature sensor is specifically designed to measure temperatures on walls and seamlessly integrate with multifunctional climate measurement devices. Sensor is suitable for integration with multifunctional devices for climate measurement.

Applications: Air Conditioning and Heating: Precise measurement of wall temperatures for improved climate and space heating regulation, Construction Sector: Monitors wall temperatures during construction or renovation to ensure effective insulation, Climate Measurement Devices: Integrates with multifunctional devices for a comprehensive analysis of climate parameters. This sensor ensures accurate measurement of wall temperatures, and its integration with multifunctional devices allows for a consolidated analysis of climate conditions in a single unit.

## 8. Light intensity measurement

The light intensity measurement device, equipped with an LCD screen, is a digital tool that accurately measures light intensity up to 50,000 lux. Its applications include ensuring ideal workplace conditions, achieving optimal results in photography or recording, attaining desired

aesthetic effects in spaces, and optimizing energy consumption by measuring light intensity in buildings.

#### 9. GIS desktop application

The GIS software is a versatile desktop application supporting diverse data types (Spatial, 3D, BIM, photogrammetry). It facilitates data viewing, editing, conversion, and provides tools for topological processing, spatial, and traffic analyses. Beyond that, it supports object network analysis, nautical charts, 3D effects, and integrates artificial intelligence for video data, scene classification, object detection, and Cloud services.

#### 10. Fracture Mechanics Clip-On Gages

The Fracture Mechanics Clip-On Gages are precision tools extensively used in fracture mechanics. They adhere to Class 1 accuracy standards, meeting ASTM E1820, ISO 12135, and ISO 9513 requirements. With  $\leq 0.2\%$  linearity within the full measurement range, a standard temperature range of  $-40\text{ }^{\circ}\text{C}$  to  $+100\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+210\text{ }^{\circ}\text{F}$ ), an integral ultra-flexible cable (standard length of 2.5 m or 8 ft), and an operating force ranging from 9 to 14 N (2 to 3 lbs), their applications span various fields. These clip-on gages find utility in material research, ensuring structural integrity in engineering and construction by measuring material fractures, conducting quality control assessments to verify material strength, and investigating material behavior under load in laboratory testing. With precise results, these gages are extensively employed in materials engineering, research and development, and across industries for quality control and assurance in material applications.

#### 11. Linear potentiometer

The linear potentiometer, used for measuring linear displacements and resistance changes, features a 50mm / 100mm active range, 5.0 kOhm  $\pm 20\%$  resistance, 3N force, maximum 0.5% linearity, and a speed of less than 10m/s. Widely applied in construction, it serves purposes like measuring vertical displacements in elevator systems, tracking linear movements in machinery, integrating into automation for precise adjustments, measuring crane positions on sites, monitoring structural displacements, and controlling doors and ramps. This sensor ensures precise linear movement measurements, enhancing control and safety in construction applications.

The equipment will be used for:

In course Building materials:

- *The Fracture Mechanics clip-On Gages* are used for precise measurement of the mechanical characteristics of materials. Students will apply this equipment in practical workshops to directly measure and analyze the mechanical properties of various construction materials. The accuracy and linearity of this gauge allow students to obtain reliable results, which will be essential for their understanding of material behavior in real construction conditions.

Considering the flexible cable and ease of operation, this device is practical for use in research and experiments related to construction materials to improve education in this field.

- Linear potentiometers (50mm and 100mm) are used to measure linear displacements in materials. Students will use these devices to investigate deformations and movements of materials, tracking the active range, resistance, and force. This equipment provides fast and reliable measurements, enabling students to explore the properties of materials within the context of construction materials thoroughly. Additionally, they can apply the acquired knowledge in practice through hands-on exercises.

In course Energy efficiency:

- Laboratory equipment like thermal camera for measuring heat transfer coefficient enhance practical teaching efficiency for students studying energy audit of buildings. The introduction of these tools aids in training students for future careers and ensures they are well-prepared for the growing demand for skills in energy certification. In particular, infrared thermography, now often a requirement for obtaining an energy certificate, is emphasized for assessing the energy efficiency of buildings. This practical application equips students with the knowledge and skills needed in the field, preparing them for real-world scenarios such as conducting energy audits and evaluating construction quality, especially for more expensive properties. Overall, the incorporation of thermographic recording in the learning process is aimed at providing students with a comprehensive understanding of energy properties, identifying areas of energy loss, and ultimately preparing them for the energy certification of buildings.

In course Spatial planning:

- Students will actively engage in exploring and practically applying the following equipment to expand their understanding of energy efficiency.
- GIS Application: Researching diverse capabilities of the GIS application to support various types of data, including spatial information, 3D scenes, BIM, and photogrammetry.
- Meteorological Station: Actively monitoring and analyzing weather data. Using a sensor unit to measure rainfall, temperature, humidity, and wind speed.
- Construction Site Floodlight Stand: Implementing a floodlight stand for effective illumination on construction sites. Adjusting height and weight according to project needs using device specifications.
- Probe-Free Manometer: Measuring air pressure, illumination, CO<sub>2</sub> concentration, temperature, and wind speed without additional probes. Utilizing the meter for fast and precise measurements of environmental parameters.
- Temperature Sensor for Wall Surfaces: Integrating a temperature sensor for measuring temperatures on walls, suitable for integration with multifunctional climate measurement devices. Through these devices, students will develop practical skills and knowledge that will aid them in researching and applying energy efficiency in various contexts.
- Light intensity measuring device: Device for measuring light intensity, the possibility of controlling a digital device with an LCD screen for measuring light intensity up to 50,000 lux with 5% measurement accuracy.

#### 4.5 The purpose of purchased the equipment at UET

The proposed equipment, aligned with our budgetary constraints, is designed to cater to both educational and research needs. It will support hands-on learning in both undergraduate and master's programs, especially in areas earmarked for modernization within this project. The chosen equipment encompasses:

1. U Value measurement items:

Thermohygrometer (With measurement value store, PC software and USB-cable incl. battery and calibration protocol) - This device measures temperature and humidity levels. Its ability to store data, interface with PCs, and come with calibration protocols makes it ideal for precise environmental monitoring. This device will be used in the *Construction Sciences course* and it aids in assessing building conditions, ensuring that materials are used and stored in optimal environments. More specifically, by this device our students will be able to verify whether HVAC systems are properly calibrated to maintain comfortable and healthy indoor air conditions.

Temperature Probe for U-Value Measurement, 3 Sensors - These probes, equipped with three sensors, are essential for determining the thermal transmittance (U-value) of building materials. This is crucial in assessing a building's insulation efficiency, affecting energy consumption and thermal comfort during laboratories hours in *Construction Sciences and Architecture Technology*.

- A. In Construction Sciences, these equipment can teach students about thermal performance, energy efficiency, and the principles of building physics. By measuring the U-value, students can understand how different materials and construction techniques influence a building's thermal insulation and energy consumption.
- B. Architecture Technology, these equipment can teach students about the principles of sustainable design, focusing on energy efficiency, indoor environmental quality, and the use of materials. Understanding how to measure and improve the thermal and airtightness performance of buildings is key.

Humidity/Temperature Probes - These devices offer precise measurements critical for detailed environmental control within buildings. They can guide the design and construction processes to ensure materials and systems respond effectively to humidity and temperature variations, crucial for the durability of building materials and the comfort of occupants. These devices will be used in construction sciences and architecture technology courses:

- A. In Construction Sciences, these probes are used extensively for several purposes:
  - a. Material Testing and Selection
  - b. Building Performance Evaluation
- B. Architecture Technology involves both the theoretical aspects of architecture and the application of advanced technology in the design and construction process.
  - a. Energy-Efficient Design
  - b. Building Simulation and Modeling

Protective Case for Equipment (Testo Service Case) - Protecting sensitive measuring equipment is crucial. This case ensures that the instruments are safely transported and stored, maintaining their accuracy and longevity.

2. Anemometers:

Testo 417 - Vane Anemometer (Set 1) - testo 417 Vane Anemometer PLUS Funnel set and Pocket-sized thermal anemometer- represents an essential toolkit for measuring wind speed and direction. This suite of tools finds its application in educational settings, particularly within *Construction Sciences*, serving as an invaluable resource for students and professionals alike. The significance of these instruments is underscored in their utility for ensuring the optimal installation and efficiency of HVAC (Heating, Ventilation, and Air Conditioning) systems. These anemometers facilitate precise airflow rate measurements through various HVAC components, such as ducts, grilles, and diffusers. This capability is critical for maintaining balanced air distribution across a building, a key factor for enhancing indoor air quality and achieving energy efficiency.

Beyond its role in indoor environments, these anemometers' utility extends to the field of *Urban Design*. It empowers users to evaluate wind flow in open spaces, including plazas, parks, and pedestrian pathways. Essential for understanding and analyzing wind patterns in urban areas. Students can study how buildings and urban layouts affect microclimates, ventilation, and pedestrian comfort, informing more sustainable urban design practices.

3. Tachometers: Testo 465 - Non Contact Tachometer - With SoftCase (protective case) in transport case (plastic), incl. reflectors, batteries and calibration protocol - this is a specialized tool designed to measure the rotation speed of a component without requiring physical contact with it. In this context, the application of this device in Construction Sciences is in the maintenance and diagnostic assessment of construction machinery and equipment. This can help students understand mechanical systems in buildings by measuring the rotational speed of fans, motors, and other equipment. This knowledge is crucial for ensuring that these systems are designed, installed, and maintained for optimal performance.
4. Blower Door: Smoke Pencil Pro Field Kit with Case - This Kit is an essential tool in Construction Sciences and Architecture Technology for ensuring buildings are energy-efficient and comfortable for occupants.

In Construction Sciences, the focus is often on the practical aspects of building and infrastructure development, including ensuring that buildings are constructed to meet specific energy efficiency and air tightness standards. The Blower Door Test, facilitated by tools like the Smoke Pencil Pro Field Kit, can be used as a practical tool for teaching about building envelope tightness and ventilation. By conducting blower door tests, students learn about air leakage, its impact on energy efficiency, and methods to improve building performance.

Architecture Technology involves the application of advanced techniques and tools in the design, analysis, and construction of buildings. Here, the Smoke Pencil Pro Field Kit serves several purposes:

- Design Verification - Architects can use the kit to verify that their designs, once constructed, perform as intended in terms of energy efficiency and air tightness. This is especially important for high-performance building designs, such as passive houses, where strict air tightness standards must be met.

Software/Tools (Agisoft Metashape, MATLAB, Turnitin):

- Agisoft Metashape: This software processes images to create 3D spatial data, which is important in both *Urban Design* and *Architecture Technology* for creating detailed, accurate models of buildings and urban landscapes. It allows for advanced analysis and visualization, aiding in the design and planning phases.
- MATLAB: A perpetual license for MATLAB provides a powerful computational tool used for a variety of applications in these fields. From data analysis and algorithm development to modeling and simulation, MATLAB is essential for tackling complex mathematical problems and advancing research in *Construction Sciences*.
- Turnitin: In academic settings, ensuring the integrity and authenticity of research is important. Turnitin supports academic integrity and originality in student projects and research. It's a tool for educators to ensure that students are engaging with their work honestly and creatively, an essential aspect of education in these fields.

The primary aim of these tools and equipment is to provide students, researchers, and professionals with hands-on, real-world applications and insights, bridging the gap between theoretical knowledge and practical application in the fields of Construction Sciences, Urban Design, and Architecture Technology. Some of these equipment assist in the following;

- *Enhancing building efficiency and comfort* - through some of these equipment allow accurate analysis of insulation properties and ambient conditions within buildings.
- *Comprehensive urban and architectural analysis* - the use of anemometers, tachometers, and software to produce 3D spatial data provide essential data for urban design considerations, from understanding wind patterns that influence building design and public spaces to visualizing urban environments in three dimensions.
- *Quality assurance* - some equipment help identify and rectify potential flaws in the construction, ensuring that buildings are airtight, energy-efficient, and safe.
- Ensuring academic integrity and authenticity of work is paramount in all disciplines, including Construction Sciences, Urban Design, and Architecture Technology, therefore we propose the Turnitin plagiarism check.

#### 4.6 The purpose of purchased the equipment at UPT

UPT, based on the list of the courses that will be modernized, has identified the need for equipment to be in use for *educational processes* and *research activities*. The purchased equipment should be applicable in *practical exercises* on the listed modernized courses as mentioned below:

In course General Geodesy 1/2, Bachelor;

In course Topographic Surveying and State Geodetic Networks 1/2, Bachelor;

In course Knowledge of urban planning and projects, Master study programs and

In research activities.

The purchased equipment encompasses 4 (four) sets of TOTAL STATIONS with the following technical specifications:

- 3" angular accuracy.
- To be with a touchscreen and color screen.
- The laser measurement distance should be no less than 1000 m.
- Prism measurement accuracy not less than 1.5 mm + 2 ppm.
- Laser measurement accuracy not less than 2 mm + 2 ppm.
- Be equipped with on-board software to enable the storage of data/measurements in the field.
- Know at least the formats for import and export of points: txt, csv, dwg, shp.
- Enable communication through Wi-Fi, Bluetooth and USB.
- To have IP not less than IP65.
- Have all possible accessories/kit parts (wooden tripod, 2.5 m pole, prism, mini prism, charger, battery, USB, user manual).

Students will use the purchased instruments for:

- Measurement of horizontal and vertical directions (calculation of horizontal and vertical angles, respectively),
- Determination of heights,
- distance measurements,
- calculating the coordinates of the geodetic network points,
- for point measurements, details for creating topographic plans,
- for checking the verticality of different objects,
- for monitoring the horizontal and vertical movements of various engineering works (dams, bridges, chimneys, tall buildings, etc.),



- for staking out/fixing on the ground various elements of various engineering works.

#### 4.7 The purpose of purchased the equipment at U\_POLIS

The incorporation of state-of-the-art equipment at POLIS University represents a pivotal step towards enhancing the efficacy of climate change analysis methodologies. Through the utilization of remote sensing technologies, students will be equipped with the tools necessary to delve deeper into the complexities of environmental shifts. By integrating this equipment into the Urban Planning Studio course, we aim to foster a comprehensive understanding of the multifaceted applications of drones in the context of climate change studies. This immersive learning experience will not only familiarize students with drone operations but also instill essential safety protocols and regulatory guidelines, ensuring responsible and ethical usage in environmentally sensitive areas.

Moreover, the course will provide hands-on opportunities for participants to engage in drone flight projects and image processing exercises, enabling them to develop proficiency in interpreting environmental data captured through aerial platforms. This practical approach not only enhances technical skills but also cultivates a deeper appreciation for the interconnectedness between environmental data and urban planning decisions.

The culmination of these efforts will result in the generation of profound insights into climate hotspots within the selected case studies. By coupling drone-derived data with GIS processing techniques, students will be empowered to identify and analyze critical environmental trends, laying the groundwork for informed decision-making and sustainable urban development strategies. Through this methodology, POLIS University endeavors to nurture a new generation of urban planners equipped with the expertise and foresight necessary to address the pressing challenges of climate change adaptation and mitigation.

By the end of this course, students will have improved their skills to not only analyze but also propose comprehensive solutions to the context of Albania. Provided with the vast dataset acquired through the advanced methodologies employed in the course, students will be equipped to tackle the multifaceted challenges posed by climate change within the Albanian landscape.

Through rigorous analysis and interpretation of the data obtained from drone flights and remote sensing technologies, students will gain profound insights into the specific environmental dynamics and vulnerabilities present in Albania. This understanding will enable them to develop targeted strategies and interventions aimed at mitigating the impacts of climate change and fostering resilience within the local communities.

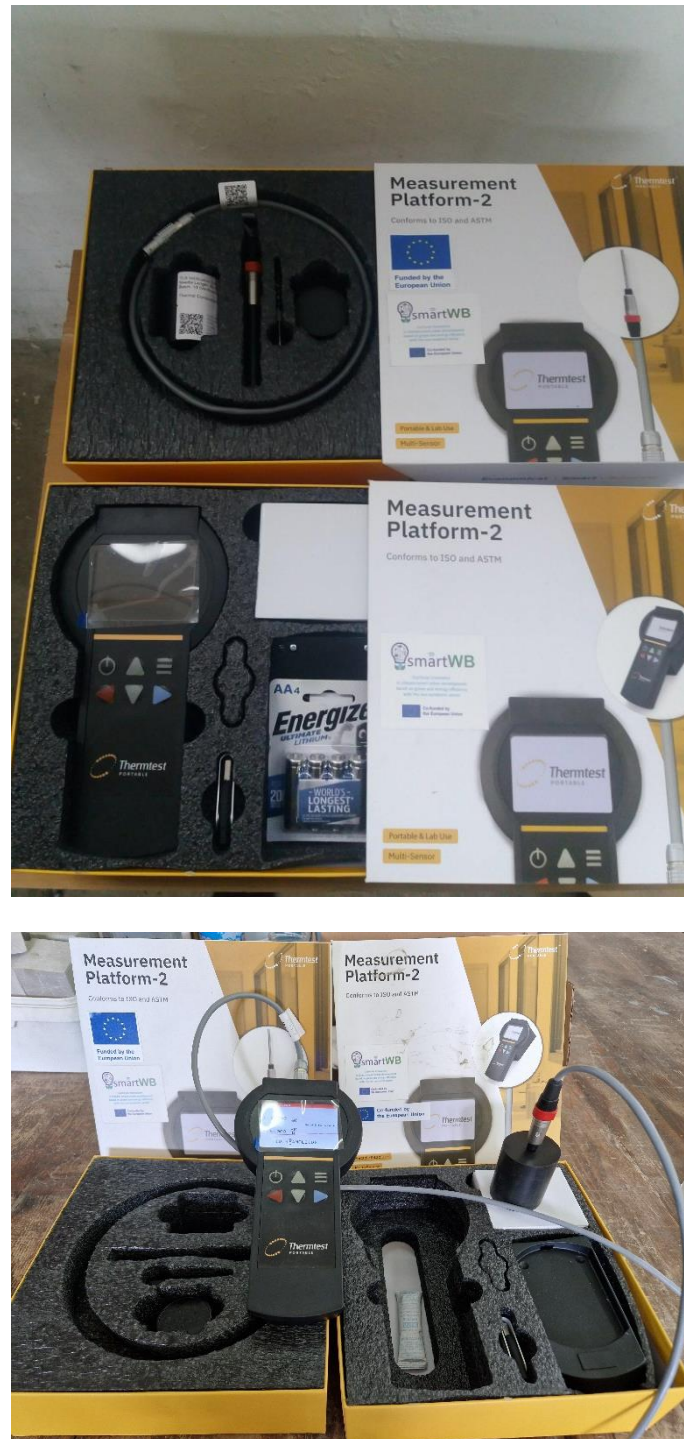
Furthermore, students will be adept at leveraging geographic information systems (GIS) to spatially visualize and model various climate change scenarios, allowing for the identification of priority areas for intervention and the formulation of evidence-based policies and plans.

Ultimately, the culmination of this course will empower students to not only understand the intricacies of climate change but also to proactively address its challenges within the Albanian context. They will emerge as competent and visionary practitioners capable of devising innovative solutions that promote sustainability, equity, and prosperity for all stakeholders in Albania's urban and rural landscapes.

As a conclusion, the main aim of this equipment was to enhance the possibility of extending further the teaching methodology combined with more comprehensive tools used through the practicable process during the modernized course of Urban Planning Studio.

## 5. Photo documentation of equipment with the Erasmus+ labels

### 5.1 UoM: Photos of the equipment



**Thermal conductivity testing system**



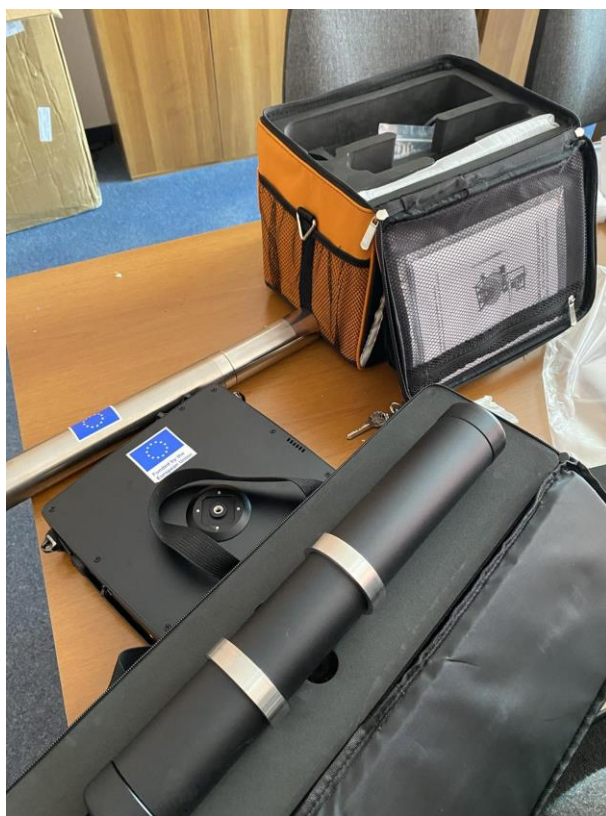
**Freezing and thawing testing system**



**Abrasion testing machine**



## 5.2 UNSA: Photos of the equipment



**Underwater inspection with HD dual cameras**



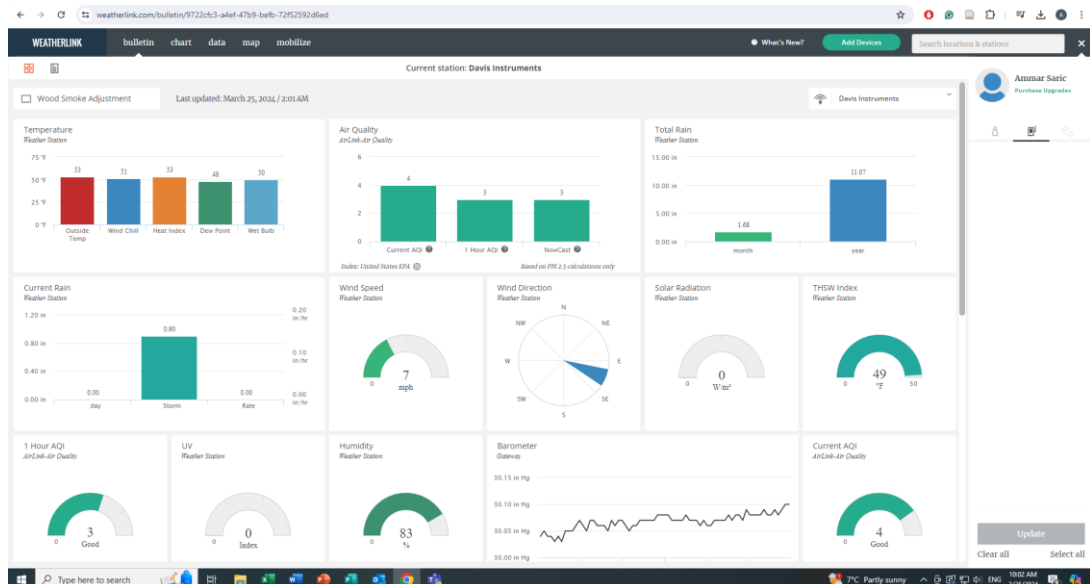
**Ultrasonic flow meter**

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## SuperMAP software installation





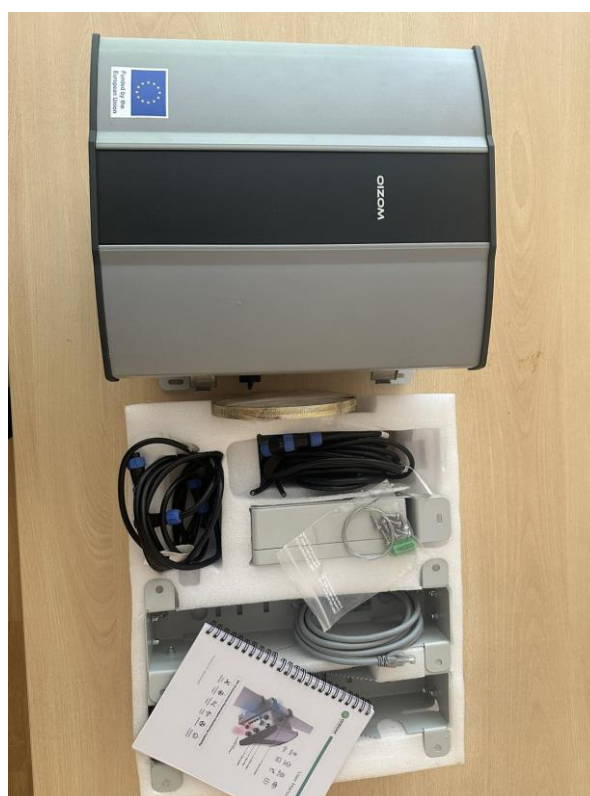
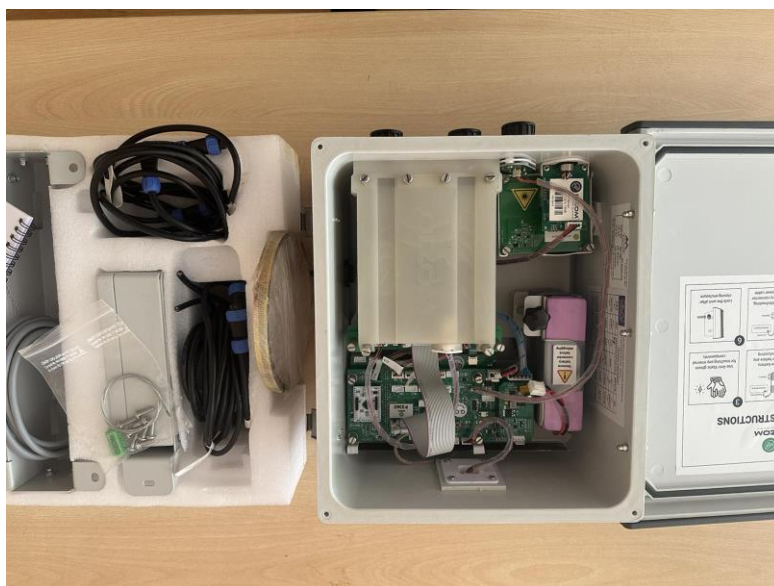
## Davis WeatherLink software installation



**Weather station**



**Tripod**



**Air quality monitoring portable device**



### 5.3 UNMO: Photos of the equipment



**Apparatus for detecting reinforcement in concrete (Bartracker)**



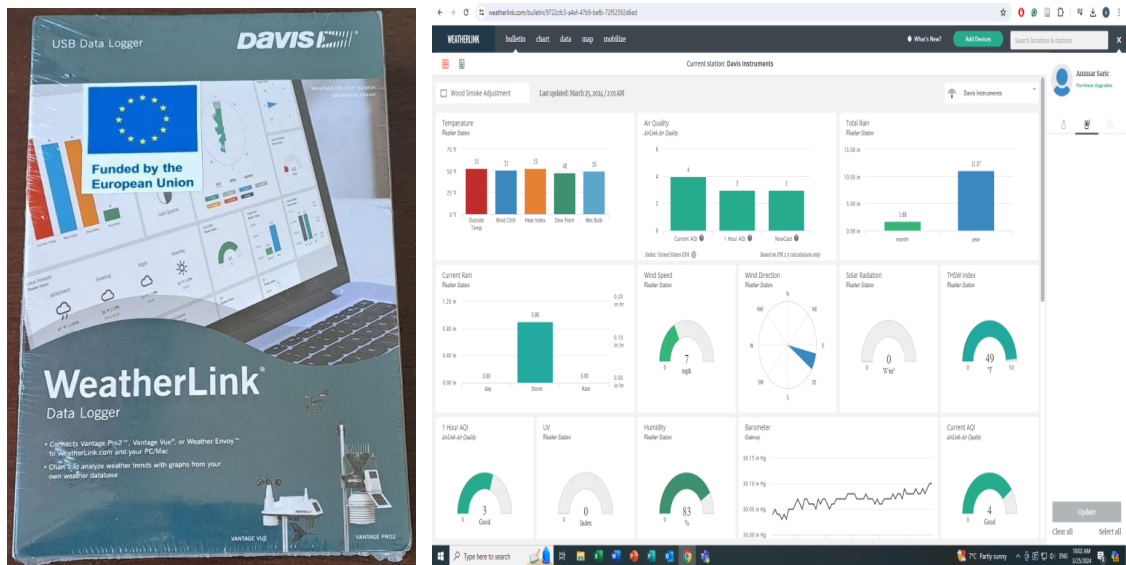
**Laboratory hammer mill**



**Chamber for simulating climatic conditions**



49



Software for processing data collected by a meteorological station



Scangrip stand-tripod



**Linear potentiometer with active range 50mm**



**Linear potentiometer with active range 100mm**





**Temperature sensor Testo 0628 7505**



**Light intensity measurement**

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Name	Type	Size	Download
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SuperMap License Center	Web	179M	<a href="#">Download</a>

SuperMap iDesktop

SuperMap iServer

SuperMap iPortal

## GIS desktop application



## Fracture Mechanics Clip-On Gages



**Air Velocity and IAQ (Indoor air quality meter) Measuring Instrument**







**Thermal camera**

## 5.5 UET: Photos of the equipment









**Thermohygrometer, Temperature Probe for U-Value Measurement, 3 Sensors  
n Humidity/temperature probes, Protective case for equipment)**

**Anemometers: Testo 417 - Vane Anemometer (Set 1), Pocket-sized thermal  
anemometer Tachometers : Testo 465 - Non Contact Tachometer Blower**

**Door: Smoke Pencil Pro Field Kit with Case**







## 5.6 UPT: Photos of the equipment





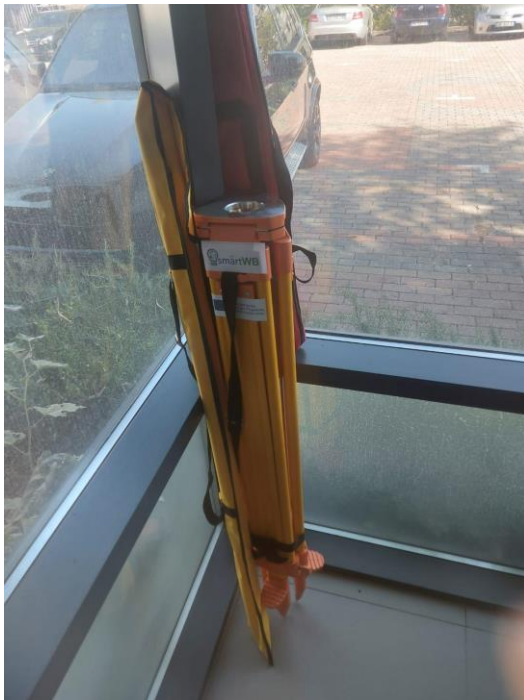




**Total stations with labels**



## 5.7 U\_POLIS: Photos of the equipment

**Indoor/ Outdoor 3D Scanner/ Teodolit and Drone**

## 5.8 Overview of the planed and purchased equipment by partner institutions

Beneficiary name	Resource type	Short name of the investments	Purchased	Comment
UNSA	laboratory equipment	Underwater inspection HD dual camera system V8-BCS-200 m	YES	
UNSA	laboratory equipment	Flow measure PCE-TDS 100H / HS	YES	
UNSA	laboratory equipment	Potable water quality devices	NO	Due to a significant increase in price, it has been excluded from the current procurement plans.
UNSA	laboratory equipment	Wireless Weather Station	YES	
UNSA	laboratory equipment	Scangrip Stand-Tripod	YES	
UNSA	laboratory equipment	Air quality monitoring portable device	YES	
UNSA	software	GIS software- SuperMAP	YES	
UNSA	software	Weather LinkR Seriell DAV-6510SER	YES	
UNBI	software	GIS software- SuperMAP	YES	
UNBI	laboratory equipment with software	Testo 883 thermal camera -30 do 650 °C 27 Hz Wi-Fi	YES	
UNBI	laboratory equipment	Testo 435-2 - Indoor air quality meter	YES	Due to the availability at the market the purchased model is TESTO 440dP, having all acquired characteristics the same as planned model.

Beneficiary name	Resource type	Short name of the investments	Purchased	Comment
UNBI	laboratory equipment	Temperature sensor Testo 0614 1635,	YES	Due to the availability at the market the purchased model is Testo 0628 7507, having all acquired characteristics the same or better than planned model.
UNBI	laboratory equipment	Wireless Weather Station	YES	
UNBI	Software	Weather LinkR Seriell DAV-6510SER	YES	
UNBI	laboratory equipment	Scangrip Stand-Tripod	YES	
UNBI	laboratory equipment	Sclerometar (Schmidt test hammer for concrete hammer test)	YES	
UNBI	laboratory equipment	Fracture Mechanics Clip-On Gages	YES	
UNBI	laboratory equipment	LVDT, Measurements in a Compact Design; Measuring Range - 50 mm; with connectors and cables;	YES	
UNBI	laboratory equipment	LVDT, Measurements in a Compact Design; Measuring Range - 100 mm; with connectors and cables;	YES	
UNBI	laboratory equipment	Light meter	YES	
POLIS	equipment	Indoor/ Outdoor 3D Scanner	YES	
POLIS	equipment	Drone	YES	
UNMO	laboratory equipment	Carbonation chamber	YES	

Beneficiary name	Resource type	Short name of the investments	Purchased	Comment
UNMO	laboratory equipment	Rebar and concrete cover scanner	YES	
UNMO	laboratory equipment	Chloride penetration	NO	Corrected according to the agreement with the coordinator, due to the increased prices on market excluded from the procurement.
UNMO	laboratory equipment	Grinding mill	YES	
UNMO	laboratory equipment	Abrasion test apparatus	NO	Corrected according to the agreement with the coordinator, due to the increased prices on market excluded from the procurement.
UoM	laboratory equipment	MP-2 main unit / Thermal conductivity test equipment: MP-2 main unit, TPS-4 sensor kit and TLS sensors: the 50 mm needle	YES	
UoM	laboratory equipment	Freezing and Thawing Chamber, 500 L, with software	YES	
UoM	laboratory equipment	Abrasion Testing Machine	YES	
UPT	equipment	Total Station 3" (4x)	YES	
UET	equipment	Thermohygrometer	YES	
UET	equipment	Temperature Probe for U-Value Measurement, 3 Sensors	YES	
UET	equipment	Humidity/temperature probes	YES	

Beneficiary name	Resource type	Short name of the investments	Purchased	Comment
UET	equipment	Protective case for equipment	YES	
UET	hardware	Testo 417 - Vane Anemometer (Set 1)	YES	
UET	hardware	Pocket-sized thermal anemometer	YES	
UET	hardware	Testo 465 - Non Contact Tachometer (2x)	YES	
UET	hardware	Blower Door (full set)	YES	
UET	hardware	Smoke Pencil Pro Field Kit with Case (2x)	YES	
UET	hardware	Drone DJI Mavic 3 and accessories	NO	Market price at the time of purchased exceeded the expected values, it has been excluded from the current procurement plans.
UET	software	Software to process images to produce 3D spatial data (2x)	YES	
UET	software	MATLAB (3x)	YES	
UET	software	Plagiarism check (2x)	YES	