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Modernization of higher education in Western Balkan countries by incorporating renewable energy engineering and energy efficiency methodologies in curricula relating to the building sector

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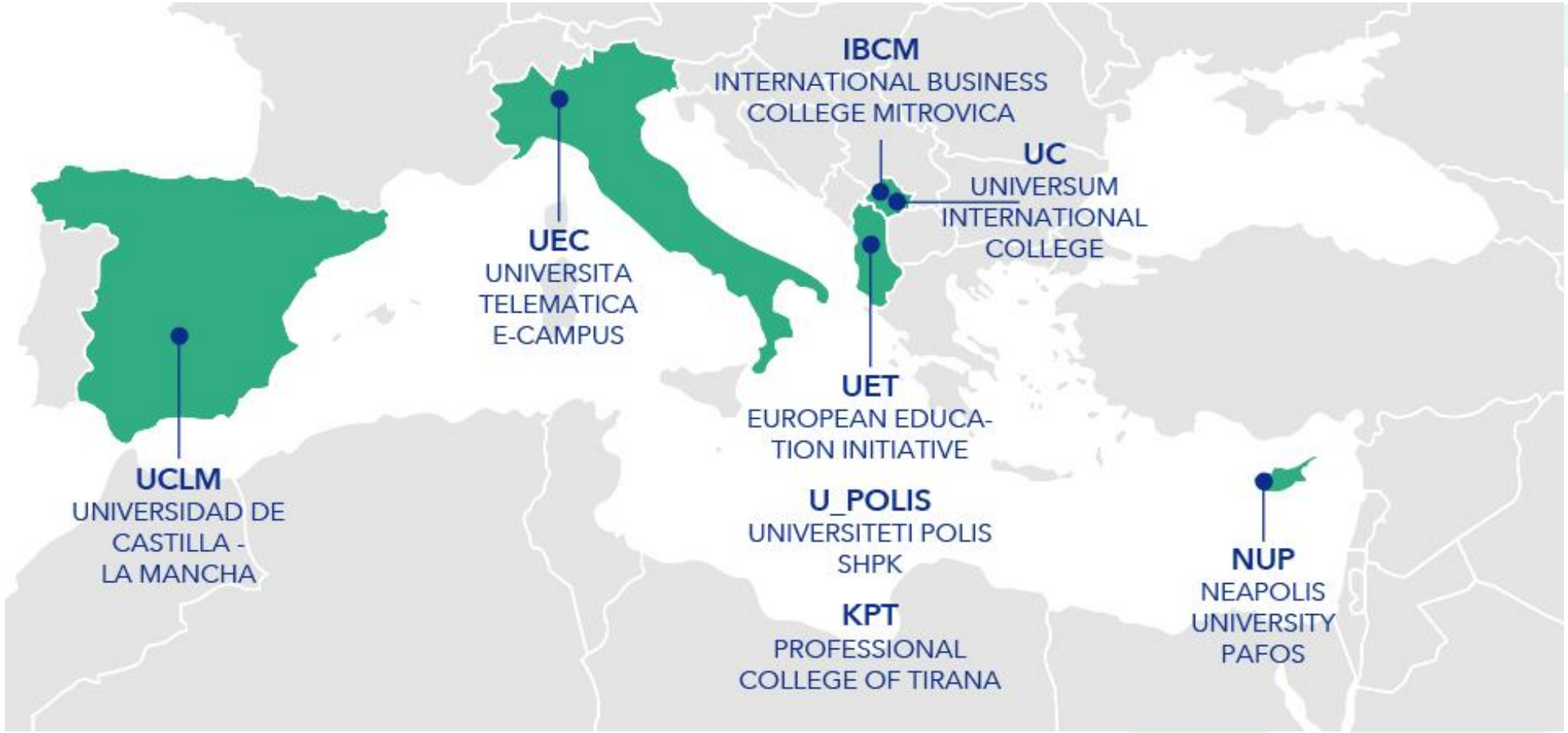
The reZEB Partnership



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Project Context

Skill Gaps in Renewable Energy Technologies and Energy Efficiency

Significant **skill shortages** in renewable energy and energy efficiency exist in two Western Balkan countries.

Educational Reform Needed

Research and industry feedback emphasize **urgent need for reform** in education and capacity building.

Modernizing Infrastructure

Updating curriculum, teaching materials, and labs **to meet current industry standards** and technology.

Skilled Workforce Development

Goal to **create a competent workforce** to advance sustainable energy solutions in the region.

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Overview of the Western Balkans Energy Systems

Outdated Energy Systems

The region **relies heavily on fossil fuels** and inefficient energy networks, hindering sustainable growth.

Renewable Energy Potential

Western Balkans has **abundant solar, wind, and hydroelectric resources** suitable for clean energy integration.

Policy and Commitment

Local leaders commit to EU 2050 climate goals, aiming for **energy system modernization** and **sustainability**.

Challenges Ahead

Significant investments and coordinated policies are **necessary** to upgrade infrastructure and adopt new technologies.

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Overview of the WB situation on EE in Buildings

High Energy Consumption

Buildings in Albania consume about **45%** of the country's total energy.
Heating demand in Kosovo is projected to **double by 2030** driven by population growth and urbanization.

Building Inefficiencies

Older buildings lack proper insulation, efficient windows, and modern mechanical systems.

Renovation Strategy

Upgrading insulation, windows, and mechanical systems reduces energy use and improves comfort.

National Policy Importance

National policies and investments are needed to support energy-efficient building retrofits.

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Nature of Modern Universities

Modern universities often evolve in **isolation**, ignoring external labor market and societal demands.

Academic programs frequently **do not align with practical skills** needed by employers in sustainability fields.

Graduates gain theoretical knowledge but **lack competencies** demanded by regional labor markets.

Closed educational systems struggle to adapt curricula to emerging sustainability trends and innovation.

Particular Challenges in Environmental Education Alignment

Environmental education attracts more students due to rising sustainability awareness.

Current education often **misses aligning with regional labor market needs** and future jobs.

Mismatch leaves **students underprepared** for real professional challenges and opportunities.

Engaging industry and policy makers helps design curricula with practical skills and market relevance.

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Methodology

- **Interviews and questionnaires** gathered insights from key sector professionals in Albania and Kosovo. Included experts from design, engineering, production, auditing, and inspection domains.
- **86 organizations responded**; 61 from Albania and 25 from Kosovo. Most organizations were small, with 20 having fewer than 10 employees and 11 large ones with over 100 employees.
- **92% of organizations focused on local or regional markets**, highlighting regional engagement.
- Majority in **Building Construction**; others in **Design, Power Production, Energy Auditing**, and **Maintenance**.
- Assessed current and future **employer needs** to guide academic curriculum development.
- Used data to shape graduate qualifications, **enhancing employability and sector growth**.

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Significance of the Project

- **Educational Innovation**

  Rare for multiple universities in one region to jointly target a single subfield.

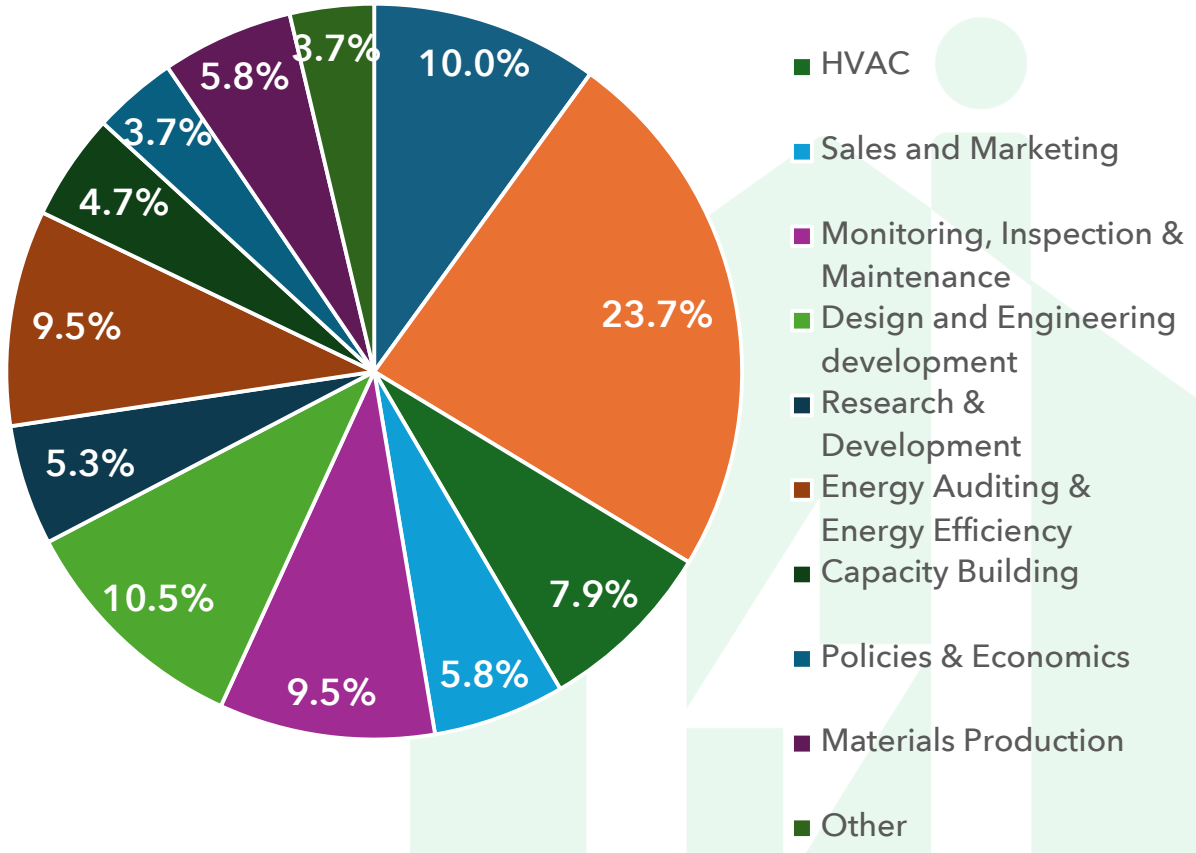
- **Stakeholder Confirmation**

  Industry experts confirmed the need for better educational programs and practical training in energy sectors. Strengthened cooperation between universities and companies.

  Project aims to jump-start the RES job market in the Western Balkans.

- **Focus on Intervention**

  Project targets educational modernization and collaboration to address skill deficiencies and support sustainability goals. Co-creation of study programs for academic and industry relevance.



Current Activity in RET and EE in the WB

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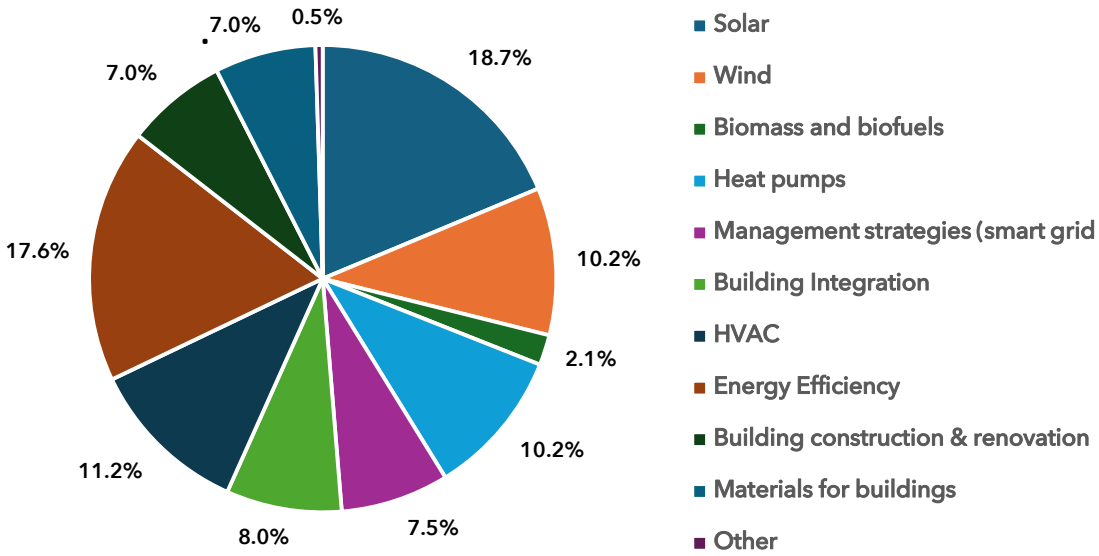
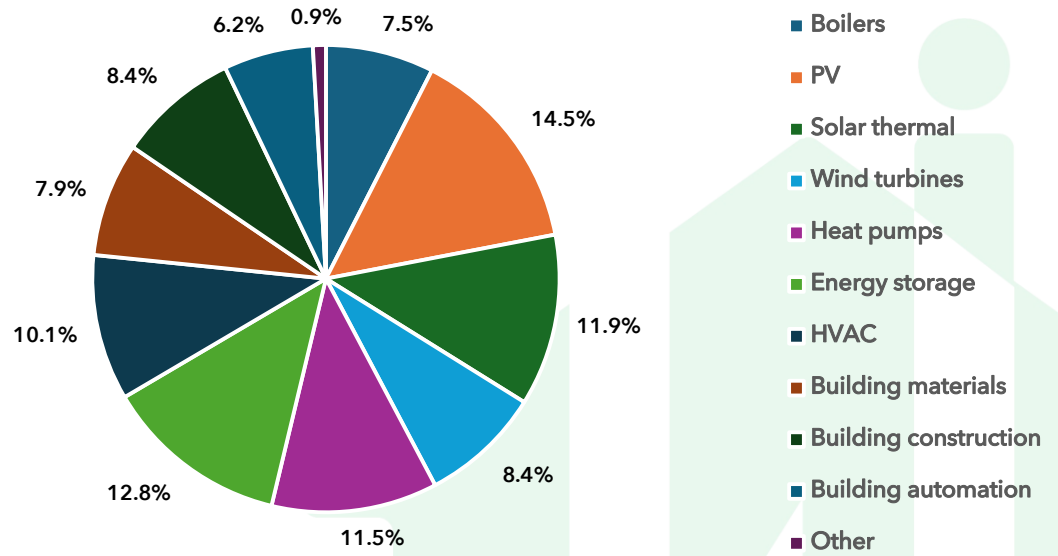
Future Demands of the Sector



Expertise



Technology

- HEIs are key in advancing sustainable building practices in Albania and Kosovo.
- Their role is recognized by national policies and strategies.
- Albania integrates renewable energy and energy efficiency in national education strategies with growing study programs.
- Kosovo struggles to align educational programs with labor market needs, limiting sustainability outcomes.

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Choosing Programs, Designing and Testing Curricula

- **Program Selection Criteria**

  Programs with high student enrollment were prioritized for modernization to maximize impact.
- **Interdisciplinary Curriculum Integration**

  Integrated social sciences and humanities into STEM and added technical content to business programs.
- **Labor Market Alignment**

  Curricula were designed to meet labor market needs while fostering holistic education.
- **Investment in Laboratory Equipment**

  Co-funded new lab equipment to support interactive learning and skill development.

Five WB HEIs chose modules for modernization after labor market survey analysis.

- **Scope:**

  26 modernized or new modules created

  Total modernization accounts for **110 ECTS**
- **Accreditation:**
  Signed by individual HEI registrars
  Compliant with local Education Department laws in Albania and Kosovo
- **Government Approval:**
  Not required since changes < 20% of total ECTS per study program

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Albania - Modernized and New Syllabi

U-Polis Program: Architecture
Architectural Technology (M)
Environmental Design Studio (M)
Technical Physics and Plant Engineering (M)
Building Materials and Constructive Techniques (M)
Building Retrofit Strategies for Sustainable Urban Regeneration (N)
Core Focus: Engineering and Architecture with added communication and management skills

EUT Programs: Architecture (IBSc), Mechanical Eng (MSc), Industrial Eng (BSc)
Building Plants & Hydraulics (Arch.) (M)
Electric Power Generation Plants & RES (Ind. Eng.) (M)
Building Energy Management Systems (Ind. Eng.) (M)
Energy Management (Mech.Eng) (N)
Electrical & Energy Measurements (Mech. Eng.) (N)
Core Focus: Collaborating with professionals of various degrees of expertise; assigning tasks & managing HR; understanding business capacity building & introducing management systems

KPT Programs: Electromechanics, HVAC, and Automotive Technology
Applied Thermodynamics (M)
Engineering Materials & Metrology (M)
HVAC and Cooling Systems (M)
Energy Allocation and Use (M)
Energy Auditing (N)
Core Focus: Competence in planning, executing & managing projects; ability to clearly communicate technical information; to understand the importance of safety, regulatory compliance & environmental considerations

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Kosovo - Modernized and New Syllabi

UC – Programs: Business and Management (BA); Management, Financial Management (MA)
Sustainable Economic Development (BA) (M)
Sustainable Energy (MA) (M)
Energy Management (MA) (M)
Life Cycle Management (BA) (N)
Understanding Energy Resources and Consumption (BA) (N)
Core Focus: Efficient resource utilization & sustainability; analysis, management and optimization of energy resources for both residential & commercial applications.

IBCM – Programs: Environmental and Agricultural Management (BA) and (MA)
Environmental Law and EU policies (BA) (M)
Project Management (BA) (M)
Renewable Energies (BA) (M)
Advanced Resources and Management (MA) (N)
Energy Management (MA) (N)
Life Cycle Assessment (MA) (N)
Core Focus: Financial considerations on implementing green energy, including economic, organization and managerial aspects

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Learning Outcomes and Implementation

Modernized Courses

Added technical solutions for building envelope

Critical awareness of interdisciplinary engineering

Indoor **environment quality**, air quality, visual comfort

Integration of eco-materials and emerging technologies

Communication and teamwork skills for **project leadership**

Resources

Updated **bibliography**, **lab equipment** (blower door, wind turbine, solar PV kits, geothermal systems, thermal imaging cameras, multimeters, hygroanemometer, thermohygrometer), **advanced design software**

Implementation

U-Polis: 125-135 students per module; student grades for module 4.4/5.0

EUT: 90 students per module

KPT: 139 students in total; positive feedback both from teaching staff and students

UC: 80-90 students in total; favorable feedback - some concern on STEM penetration to non-STEM topics

IBCM: 16 students per module; student grades 4.5/5.0; increased interest in the field, approval of the Industry-university collaboration.

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Modernizing Curricula – Key Highlights

Collaborative effort

Rare example of identifying employability skills via **field research** and **job market questionnaires**.

Novelty of work

Wide applicability in Western Balkans (WB).
Contribution to **sustainable built environment** in Europe.
High specificity in **aligning educational material with Renewable Energy** (RE) job market demands.
Five WB HEIs chose modules for modernization after **labor market survey analysis**.

Previous efforts

Small-scale and isolated.
Focused on single universities.

Our approach

Comprehensive modernization.
Regional impact.
Strong alignment with **job market needs**.

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Conclusions

Principles of Curriculum Design

Educational **Goals Alignment**
Graduate Competency Expectations
Balance of Theory and Practice
Holistic Graduate **Preparation**

Competitiveness and EU alignment

Graduate **Market Competitiveness**
Environmental Education Strategy
Curriculum **Alignment with EU Policies**
Employability and **Sustainability**

reZEB project impact

Enhance **collaboration** between higher education and the local labor market for relevant education
Curriculum Modernization
Graduate **Employability**
Sustainable Workforce Development