Visegrad Fund

BEST PRACTICE REPOSITORY ON GREEN MEASURES DEVELOPED BY UNIVERSITIES

UNIVERSITY OF MONTENEGRO

UNIVERSITY OF PÉCS

UNIVERSITY OF SARAJEVO

MASARYK UNIVERSITY

JAGELLONIAN UNIVERSITY OF KRAKOW

J. SELYE UNIVERSITY

PANNON EUROPEAN GROUPING OF TERRITORIAL COOPERATION

2025

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1. INTRODUCTION & METHODOLOGICAL APPROACH

OBJECTIVE AND SCOPE OF THE REPOSITORY

The Best practice repository on green measures is one of the key outputs of the project "Accelerating and Enhancing Green Transition: Collaboration of universities in climate adaptation." It focuses on education and capacity building, strengthening professional networks among educational institutions, and supporting the mobility of students, researchers, and educators to facilitate the exchange of best practices.

Alongside the situation analysis, this repository was developed to collect and showcase good and best practices. It serves as a dynamic source of inspiration and practical knowledge for project partners as well as for other institutions aiming to improve their sustainability performance.

The repository compiles green and sustainable measures implemented by selected universities participating in the Visegrad Fund initiative. Its objective is to map successful approaches, evaluate their level of maturity, and provide a comparative overview of practical solutions that support the green transition in higher education institutions.

The Best practice repository offers replicable ideas not only for universities, but also for other organisations across the region—including municipalities, chambers of commerce, and civil society organisations.

DOCUMENT STRUCTURE DESCRIPTION

The document is organized into four main sections, each addressing key aspects of sustainability practices within participating universities:

1. Introduction & methodological approach

This section outlines the objective and scope of the repository, introduces the universities involved in the study, and describes the data collection methods along with the framework used for comparative analysis.

2. Comparative overview of sustainability approaches

Here, the document presents a comparative analysis of how sustainability is implemented across the universities. It covers the stages of implementation, an overview of institutional

sustainability strategies, the role of stakeholder engagement, identification of enablers and barriers within institutions, and the processes for monitoring and evaluating progress.

3. Best practices by thematic areas

This core section details successful sustainability practices, categorized into thematic areas such as waste management, energy management, public procurement, sustainable catering, transport, water management and biodiversity, green construction, sustainable IT infrastructure, education, research, and social engagement and awareness.

4. Recommendations for scaling and replication

The final section provides guidance and strategic recommendations aimed at scaling successful practices and replicating them in other university contexts to enhance sustainability efforts more broadly.

PARTICIPATING INSTITUTIONS

Participating universities:

- University of Montenegro
- Masaryk University
- Jagiellonian University of Krakow
- University of Pécs
- University of Sarajevo
- J. Selye University
- Pannon European Grouping of Territorial Cooperation

DATA COLLECTION AND COMPARISON FRAMEWORK

The content has been compiled based on inputs provided by these institutions. Each university provided qualitative information structured around a common set of questions, which were then thematically analysed and compared.

2. COMPARATIVE OVERVIEW OF SUSTAINABILITY APPROACHES

IMPLEMENTATION STAGES ACROSS UNIVERSITIES

Universities across the region are at varying stages of implementing sustainability measures, ranging from initial strategy development to advanced monitoring and evaluation. A common trend is the transition from isolated green actions toward systemic and strategic integration of sustainability into university operations, governance, infrastructure, and education.

University of Montenegro (UoM) has reached an advanced stage of sustainability implementation and evaluation. It has moved beyond planning and is actively integrating sustainability into all institutional levels. Guided by comprehensive strategic documents (e.g. the 2019–2024 Development Strategy and the 2024 Climate and Sustainability Plan), UoM evaluates progress regularly to ensure alignment with national and EU goals.

Jagiellonian University (JU) is in the initial phase of implementing its Climate-Ecological Strategy 2030, introduced in 2024. Despite being early in this specific strategy, the university has already engaged in various sustainability initiatives prior to its adoption. Current efforts aim to expand and formalize these practices under the new strategy, with implementation underway.

Masaryk University (MU) is already actively implementing its sustainability strategy and is recognized as a national leader in this field. Sustainability considerations are embedded in operational decisions, such as evaluating environmental impact in all investment projects. The university follows a systematic approach, aligned with clearly defined strategic goals.

University of Pécs (UP) demonstrates a mature and evolving approach to sustainability. Over the past decade, it has launched numerous initiatives through its UP Green University Program. The university combines implementation with regular monitoring and evaluation, and maintains a flexible strategy that allows for innovation and adaptation to emerging environmental and legislative trends.

University of Sarajevo (UNSA) is in the implementation and early evaluation phase. Certain projects, such as solar panel installations and curriculum development, are actively ongoing. However, the lack of an overarching institutional sustainability policy results in a partial and fragmented integration of sustainability, often driven by individual faculty initiatives or funding opportunities.

J. Selye University (JSU) is currently in the early implementation stage. Following the completion of initial steps such as introducing selective waste collection and finalizing infrastructure upgrades (LED lighting, heat pumps, solar collectors), the university is moving toward monitoring and evaluating the effectiveness of these measures. The focus now lies on data collection and feedback mechanisms to ensure continuous improvement.

OVERVIEW OF SUSTAINABILITY STRATEGIES

University	Main strategy documents	Status	Link (if available)
University of Montenegro	Development Strategy 2019–2024, Climate and Sustainability Plan (2024)	Implemented, under evaluation	
Masaryk University	Sustainability Strategy (2025–2028)	Implemented, faculty sub-strategies in preparation	https://sustain.muni.cz
Jagiellonian University	Climate-Ecological Strategy 2030	Early phase of implementation	
University of Pécs	UP Strategy 2023–2030	Ongoing implementation and evaluation	
University of Sarajevo	Sustainability elements in the 2019–2023 strategy	New draft under development	
J. Selye University	Long-term development plan (with green priorities)	Implementation of defined measures	

STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a cornerstone of successful sustainability transitions at universities. Masaryk University (MU) emphasizes participatory governance through its **Sustainability Council, faculty-level councils** in strategy creation. Students at MU are empowered through the ComMUNIty Fund, which provides participatory budgeting for green projects. The University of Pécs (UP) engages all university citizens in its bottom-up **Green University Program**, encouraging **active roles for students, staff, and management**. The University of Montenegro (UoM) focuses on mobilizing students via sustainability competitions and projects and involves faculty in interdisciplinary research hubs. Jagiellonian University (JU) identified **academic staff and management** as primary change agents, particularly through initiatives like **the JU Climate Council** and its strategy formulation. At UNSA, **students and academic staff**—especially at faculties such as Agriculture, Mechanical Engineering, Electrical Engineering, Forestry, and Traffic and Communications—play an active role. Tree-planting campaigns and practical trainings on solar technologies help turn them into effective sustainability ambassadors. At J. Selye University (JSU), all stakeholder groups play a role in implementing sustainable practices. Lecturers support digital education, students are involved in green initiatives and responsible travel, and leadership commits to long-term planning. **Technical staff** are crucial in maintaining energy systems. Faculty units develop green curricula, making sustainability a shared mission.

In all institutions, the **emphasis lies in cross-sectoral collaboration and engagement that goes beyond administrative mandates to community participation**.

INSTITUTIONAL ENABLERS AND BARRIERS

Key enablers across institutions include strategic alignment with **long-term university plans, the establishment of sustainability governance bodies, availability of EU or national funding, and visibility through dedicated sustainability platforms**. Masaryk University has institutionalized its approach with clear links between its Strategic Plan and its Sustainability Strategy, operationalized by councils and online tools. UP leverages its deep integration with the city of Pécs and a flexible responsive program structure. UNSA reports that strong faculty-level commitment and community-driven projects serve as key enablers. JSU includes the **leadership's commitment** and the successful completion of major energy-efficient infrastructure upgrades.

Barriers reported include **lack of financial resources for infrastructure change, decentralized campuses, technical limitations, and stakeholder fatigue**. JU notes bureaucracy and institutional inertia as delays to progress, while UoM highlights limited resources and the difficulty of integrating sustainability throughout the university hierarchy. UNSA reports the **absence of a comprehensive institutional sustainability framework** as a significant barrier. Most actions are initiated on a faculty level or triggered by external funding. At JSU limited financial resources and **the protected status of the main FEI building** restrict further developments.

Innovative responses included gamified awareness campaigns, flexible strategies, asset management tools, selective modernisation and data-driven operations.

MONITORING AND EVALUATION OF PROGRESS

MU is one of the few in the group to have implemented detailed monitoring of its **carbon footprint**, using the data to inform new mobility and energy strategies. It also publishes annual **Sustainability Reports** aligned with strategic goals. UP uses **global benchmarks like the UI GreenMetric** to continuously track and improve sustainability indicators and includes real-time monitoring tools for utilities. JU is developing a fully structured **implementation plan** for its Climate-Ecological Strategy 2030, **including milestones, indicators, and a dedicated oversight team**. UoM assesses progress through its **strategic plans and periodic updates** to its sustainability and internationalization frameworks. UNSA has partially included sustainability indicators in its strategic planning documents and is currently working on a new institutional strategy where sustainability is expected to become a pillar. Monitoring is still **informal and varies across faculties**. Monitoring at JSU is in the early stage. A **system for tracking** electricity, heating consumption, and the performance of solar collectors **is being developed**. **A full impact analysis will follow** after one year of operation, with results feeding into the sustainability strategy.

A common theme is the integration of monitoring into digital platforms and participatory governance processes.

3. BEST PRACTICES BY THEMATIC AREAS

WASTE MANAGEMENT

Effective waste management is a crucial component of university sustainability strategies. This repository captures a wide range of best practices that demonstrate how academic institutions can significantly reduce their environmental impact through innovative and systemic approaches. Key themes emerging from these practices include:

- **Systematic waste reduction**: Digitalization, centralized regulations, and strategic policies are helping universities minimize waste generation at the source.
- **Recycling and reuse**: Comprehensive recycling infrastructure, composting systems, and the reuse of furniture and materials are promoting circular resource use.
- **Behavioral change and engagement**: Awareness campaigns, incentives, and education initiatives are essential tools in building a zero-waste culture.
- **Policy alignment and innovation**: Institutions are aligning their actions with EU directives and national plans while investing in technologies like asset management systems and internal marketplaces to reduce and reuse more effectively.

Below is a greater detail of the practices of individual universities.

1. Recycling infrastructure

- Campus-wide recycling bins (UoM, MU, UP): Clearly labeled bins for paper, plastic, glass, and other materials in key locations (faculties, buildings, common areas) to promote proper waste separation.
- Selective waste collection and reuse (JSU): Waste sorting is implemented across university corridors, supported by awareness materials. Paper is reused for note-taking and printing on unused sides. Students and staff are encouraged to reduce plastic waste in everyday choices (e.g. avoiding coffee capsules and disposable cutlery).
- BOBR Containers and compaction equipment (UP): Rationalization of waste collection with targeted bin types and compaction equipment to reduce collection frequency and costs.

2. Paper and digital waste reduction

- Digital document systems (UoM, JU, MU): Implementation of document management systems (DMS), E-Index, and integrated electronic signature tools to eliminate paper-based operations.

- Centralized billing and paper-saving rewards (JU): University-wide policies to reduce paper usage, incentivizing departments with the best paper-saving results.
- Printing waste reuse (UP): Paper offcuts from the university's printing operations are reused to create free writing pads.

3. Food and packaging waste

- Ban on single-use packaging (JU): Drafted regulations to eliminate food sold in plastic/cardboard packaging in canteens and other food outlets.
- Reusable and returnable food containers (MU): Students are encouraged to bring their own containers; a new tender is in place for recyclable food packaging solutions.

4. Green promotion (UoM): Use of eco-friendly gifts (e.g., olive oil from university-owned vineyards) instead of conventional, waste-heavy promo materials.

5. Furniture and equipment reuse

- Furniture donation and redistribution (UP): Storage, repair, and reuse of scrapped furniture; donations to local institutions; internal redistribution via a new asset management software.
- Marketplace for surplus equipment (UP): A digital platform allowing internal exchange and reuse of redundant but functional equipment, reducing procurement and disposal needs.

6. Monitored e-waste collection (UP): Enhanced and supervised e-waste disposal systems planned for implementation in 2025.

7. Organic waste

- Separate bio-waste collection (UP, MU): Dedicated bins for green and organic waste, including leaves, branches, and trimmings from campus gardens and research stations.
- Composting and green waste reuse (UP): Composting of botanical garden waste and reuse of shredded green waste in viticulture and enology plantations.

8. Circular economy research and strategy

- Strategic waste plans and audits (MU): Adoption of a formal Sustainable waste management strategy and internal audits led by the Sustainability and Circularity Institute to inform decision-making.

- Circular economy education and research (MU, UP): Faculty-led research into circular practices and systemic implementation of circular economy principles into university operations.

9. Awareness and engagement

- Campaigns and workshops (UoM, UP): Regular education activities targeting students and staff to build awareness of waste reduction and responsible consumption.
- Targeted messaging on waste streams (UP): The university monitors different areas (e.g., dorms, labs, canteens) to identify which ones generate the most waste, and what kind of waste it is (e.g., food waste, paper, plastic). Based on this data, they design tailored messages and awareness materials (like posters, workshops, digital content) that speak directly to the people using those areas.

More on this topic in chapter Social engagement and awareness.

10. Integration with national/EU policies (UP, MU): Waste strategies aligned with national waste targets (e.g., 55% recycling by 2025) and new EU directives, including mandatory textile waste separation.

ENERGY MANAGEMENT

Universities are large and energy-intensive institutions, making energy management a critical area for sustainability. The best practices show a comprehensive approach that combines **infrastructure upgrades, renewable energy, intelligent monitoring, and behavioural change**. Strategic investments in solar panels, smart systems, and user awareness have helped reduce carbon footprints while optimizing operating costs. Key trends identified include:

- Smart technologies and monitoring: Widespread deployment of intelligent control systems, building management systems (BMS), and CAFM tools enables data-driven decision-making and operational savings.
- Renewable energy expansion: All institutions are investing in solar panels, district heating, and green electricity contracts to transition from fossil-based sources.
- Green infrastructure: Buildings are being renovated with energy-efficient lighting, insulation, and heating/cooling technologies that comply with the highest energy standards.
- Behavioural and educational measures: Universities foster long-term change through awareness campaigns, student and staff training, and interactive tools for sustainability education.

Now let's dive deep into practice.

1. Renewable energy generation

- Solar panel installations (UoM, JU, MU, UP, UNSA): Widespread installation of rooftop photovoltaic panels on academic and administrative buildings to produce renewable electricity. Panels often double as shading elements, improving thermal comfort indoors. And in case of UNSA, they also serve for educational purposes.
- Green Electricity Purchase with Guarantee of Origin (MU): Masaryk University was among the first large institutions in the country to switch entirely to certified green electricity in 2021.

2. Heating system modernisation

- Biomass district heating integration (UP): University buildings—including clinics—are connected to a biomass-based district heating network to eliminate fossil fuel use.
- Sustainable heating reconstruction (UoM): Heating systems have been retrofitted in line with ECO standards to enhance energy efficiency and lower emissions.

3. Smart energy management

- Building management systems and CAFM integration (MU): A robust BMS system is used to monitor and manage energy usage in real-time. It is integrated with a computer-aided facility management system to optimize operations and reduce energy waste.
- Comprehensive energy retrofit and monitoring (JSU): JSU carried out a multi-building energy retrofit, including LED lighting, heat pumps, window sensors, and solar collectors. The university initiated a monitoring system to track monthly energy consumption, self-generated electricity, and heating cost reduction.
- Energy management software for ROI monitoring (UP): New software allows UP to track savings from energy retrofits and calculate financial returns, supporting further investment decisions.

4. Efficient lighting technologies (MU, UP, UoM): Comprehensive replacement of outdated lighting systems with energy-saving LEDs across faculties, offices, and public spaces. Lighting systems in key buildings automatically adjust based on occupancy and daylight, cutting unnecessary consumption. Public exterior lights are being upgraded with dimming technology to reduce energy demand during low-traffic hours.

5. Cooling and ventilation controls (UP, MU): Regulations restrict cooling systems in public spaces to 25°C or above to minimise energy use while maintaining comfort. Energy-efficient air-conditioning systems with heat recovery technology improve indoor air quality and reduce overall energy needs.

6. High-efficiency equipment standards (UP, MU): Universities prioritise the purchase of top-rated energy-efficient devices during upgrades and replacements (procurement of A+ and AA+ appliances).

7. Electric mobility infrastructure (UoM): EV charging stations and a small electric vehicle fleet support low-emission transport solutions on campus.

8. Continuous monitoring and audits

- Signalised energy monitoring (Every 15 min) (UP): Over 90% of gas and electricity consumption points are fitted with real-time monitoring capabilities to support rapid optimisation.

- Energy audit (MU): A formal energy audit conducted under national legislation (Act No. 406/2000 Coll.) guides ongoing improvements and regulatory compliance.

9. Behavioural change and engagement

- #MUNIsaves awareness campaign (MU): Behaviour-focused campaigns motivate students and staff to adopt energy-saving habits, supported by workshops and clear operational guidelines.
- User instructions and energy etiquette (UP): Clear rules on heating and air-conditioning use are distributed to building occupants to prevent energy waste.
- Interactive education (UP): Green aura field tables – interactive models featuring energy and sustainability systems help students and visitors understand energy innovations through AR experiences.

PUBLIC PROCUREMENT

Sustainable public procurement (SPP) is a powerful tool for universities to reduce their environmental and social footprint while supporting innovation and responsible business. The following practices demonstrate how procurement can become a strategic driver of sustainability across institutions. Key trends identified include:

- **Policy integration and legal frameworks**: Universities are embedding sustainability principles directly into procurement regulations and codes.
- **Supplier engagement and transparency**: Initiatives such as dynamic purchasing systems, capital plans, and buyer-supplier forums increase market access and accountability.
- **Green and social criteria**: Institutions apply life-cycle costing, prioritize eco-labels and energy efficiency, and include labour and social safeguards.
- **Digitalization and asset optimization**: Public procurement is increasingly paperless, and asset reuse platforms support circularity and efficiency.

Below is a greater detail of the practices of universities.

1. Strategic frameworks for responsible procurement

- Responsible public purchasing strategy (MU): Responsible public purchasing (RPP) strategy aligned with its long-term Strategic plan, embeds environmental and social values into procurement. This includes: life cycle costing and non-price evaluation criteria, fair working conditions and occupational safety in tenders, emphasis on eco-friendly and durable products.
- Legal embedding of sustainability (UP): The procurement and public procurement code at UP mandates the inclusion of sustainability in all procurement procedures. It references national and EU standards and promotes socially responsible economic actors, participation of local SMEs, and use of digital, paperless procurement systems.
- Integration of sustainability into institutional purchasing policy (JU)

2. Supplier access and transparency

- Supplier engagement (MU): MU supports open and inclusive procurement through dynamic purchasing systems that encourage participation of smaller suppliers, annual “Meet the Buyer” events.

- Digital asset management and marketplace (UP): UP is developing a digital asset management system that supports traceability and internal redistribution of assets and includes a "marketplace" for reusing redundant equipment.

3. Green criteria in purchasing decisions

- Application of Green Criteria (UP): UP consistently applies green procurement criteria by preferring energy-efficient equipment (A+, AA+), recycled or environmentally friendly materials and durable products with low running and maintenance costs.
- Eco-friendly and local goods (UoM): UoM prioritizes environmentally friendly and locally sourced products in procurement processes to support local economies and reduce transport emissions.
- Green procurement priorities (JSU): During recent energy retrofits, JSU required suppliers to meet energy-efficiency standards (e.g. LED, heat pumps, motion sensors). Preference is given to local/regional vendors and recycled paper products.

4. Monitoring and capacity building (MU): MU is a member of the national Responsible public procurement platform and reports annually on procurement plans and achievements. It invests in staff training on sustainable procurement.

SUSTAINABLE CATERING

Sustainable catering is a key part of university efforts to reduce environmental impact and promote health. Universities focus on using local, seasonal ingredients and offering plant-based options to lower their footprint. Food waste is minimized through careful planning and portion control, while packaging waste is reduced by encouraging reusable containers.

Hygiene, water quality, and energy efficiency are also priorities. Affordable and nutritious meals ensure social accessibility. Partnerships with innovative caterers highlight the connection between sustainability and health.

1. Local and seasonal sourcing (UoM, JU, MU, UP, JSU): Universities prioritize use of local and seasonal ingredients at events to support local producers and reduce transport emissions. JSU prioritizes local small catering businesses sourcing from regional producers.

2. Plant-based and inclusive menu options (MU, UP): Menus cater to omnivores, vegetarians, vegans, and special diets (gluten-, lactose-free), ensuring nutritional diversity and accessibility. MU dedicated veggie bar offering vegetarian, vegan, and RAW food options.

3. Food waste minimization (UoM, MU, UP, JSU): Catering designed to minimize waste through careful event planning. MU and UP has pre-order system for meals, adjustable portion sizes, and campaigns encouraging use of reusable containers. At JSU portions are planned based on registrations to avoid food waste.

4. Packaging waste reduction and recycling (JU, MU, UP, JSU): JU reduces procurement of single-use plastic packaging for food and beverages. At MU packaging waste is sorted and food waste processed for biogas. UP has reusable “RESTO box” (durable reusable takeaway food box), that reduces single-use packaging waste. At JSU reusable plates, cups, and cutlery are standard at events.

5. Hygiene (MU, UP): MU has free tap water with UV sanitation lamps in canteens and regular microbiological inspections to ensure food safety.

6. Energy and resource efficiency (UP, MU): MU trained staff in energy and water conservation and is gradually replacing older kitchen equipment with energy-efficient technologies.

7. Social and economic accessibility (UP, MU): UP reduced meals prices for students and staff.

8. Innovative catering solutions and partnerships: UP collaborates with Catey (specialized health/social care catering) and RESTOme (reusable takeaway boxes).

SUSTAINABLE TRANSPORT

Sustainable transport initiatives across the universities combine infrastructure development, organizational measures, and cultural support to reduce carbon footprints and promote healthy, environmentally friendly mobility. Key focus areas **include expanding cycling infrastructure, supporting low-emission vehicles, financially incentivizing sustainable travel choices, and long-term strategic planning for green mobility**.

1. Infrastructure and facilities

- Bicycle parking facilities (UoM, UP, JSU): universities provides dedicated bicycle parking across its campuses to encourage safe and convenient bike storage
- Bicycle-friendly campus infrastructure (JU, MU): JU collaborates with the City of Krakow to expand cycling path networks leading directly to its campuses, promoting daily commuting by bike. MU provides comprehensive support for cycling with bike racks, showers for cyclists, and charging stations for e-bikes and electric cars, creating a full ecosystem for sustainable mobility.
- EV charging stations and electric vehicle fleet (UoM, UP, UNSA): The Faculty of Mechanical Engineering at UoM has installed electric vehicle charging stations and operates electric vehicles for logistical purposes. At UNSA the Faculty of Traffic and Communications leads the PELMOB project, which supports the promotion and development of electric mobility solutions.
- Public transport infrastructure support (MU): MU supported the construction of a tram line connecting the Bohunice campus with the city center, improving accessibility and encouraging staff and students to use public transportation more frequently.
- Green transport incentives (JSU): JSU ensures free public bus transport between university and dormitories in cooperation with the city.

2. Financial and organizational support

- Financial support for low-carbon travel (JU): JU implements a flexible financial support scheme for low-carbon travel, allowing employees to choose potentially more expensive but environmentally friendly travel options, such as longer train journeys instead of flights.
- Employee commuting surveys and carbon footprint integration (MU): MU conducts surveys on employee commuting habits and incorporates this transportation data into its Carbon Footprint Study.

- Centralized and optimized logistics transport (UP): UP has optimized its logistics by replacing individual deliveries with centralized round trips.

3. Promotion of active mobility culture

- Cycling promotion programs and events (UP): UP actively promotes cycling through programs like "Cycling Breakfasts" and free bicycle rentals for employees. The university organizes cycling competitions and awareness campaigns during European Mobility Week. The university also offers a shared fleet of electric bikes supported by external partners, expanding sustainable transport options.
- Sustainable travel culture (JSU): Students often choose trains or carpooling. The university encourages carbon-free commuting and provides infrastructure to support it.

4. Sustainable transport policy integration (UP): UP has developed a long-term sustainable transport strategy aiming to become Hungary's greenest university. Investments in infrastructure, fleet electrification, and innovative programs demonstrate its strong commitment to environmental responsibility and zero-emission mobility solutions.

WATER MANAGEMENT AND BIODIVERSITY

Universities implement integrated **water-saving, rainwater harvesting, and biodiversity-enhancing measures through green infrastructure, ecological landscaping, awareness campaigns, and applied research**. These efforts contribute to climate resilience, community wellbeing, and protection of urban ecosystems.

1. Water retention and use

- Green roofs and decentralized drainage (MU): Bohunice campus features extensive green roofs and a decentralized rainwater drainage system recognized by the Ministry of Environment, enhancing water retention and reducing runoff.
- Rainwater tanks in botanical garden (MU): A combined 48 m³ capacity underground system irrigates greenhouses automatically, significantly reducing municipal water use. Project ROI estimated at 7.5 years with 85% funding from EU sources.
- Rain gardens and stormwater infiltration (UP): As part of the SpongeCity project, UP supports nature-based solutions such as rain gardens and reduced impermeable surfaces to mitigate flash floods in Pécs.
- Reuse of pool water for irrigation (UP): Greywater from campus swimming pools is repurposed for landscaping irrigation to reduce freshwater use.
- Rainwater use (JSU): During reconstructions, JSU prioritizes rainwater drainage and partial reuse for irrigation.

2. Campus design for biodiversity and climate resilience

- University park and native landscaping (UoM): A large central park integrates native flora, shade trees, and pollinator habitats, creating a biodiversity-rich recreational zone and urban cooling corridor.
- "Wawel Avenue" green corridor (JU): Gradual transformation of paved central avenues into shaded, tree-lined walkways to increase stormwater absorption and improve microclimate.
- Agricultural biodiversity base (UoM): The Ljeskopolje experimental base includes cultivated plots for native plant species, seed preservation areas, and a wetland section supporting agroecological research and biodiversity education.
- Reduced grass cutting and leaf blower ban (JU): Urban meadow management enhances insect habitats and soil health while lowering emissions from maintenance equipment.

- Bird- and bat-friendly infrastructure (UP, JU): Measures include anti-collision glass stickers, nesting boxes, feeders, and waterers across campuses to support urban wildlife.
- Native landscaping (JSU): Green areas around dormitories and faculties are planted with native species to enhance biodiversity and reduce maintenance needs.

3. Water-saving technologies

- Infrared taps and percolators (UP): Campuses upgraded taps with motion sensors and optimized percolators to reduce water waste.
- Dual flush toilets and Lokni dispensers (MU): Water-efficient restroom systems and filtered water stations support responsible consumption and reduce bottled water dependency.
- Water-saving fixtures (JSU): Water-saving toilets are installed in multiple buildings.

4. Engagement, research and education

- DRYvER citizen science app (UP): Developed in Horizon 2020 project, the app enables public mapping of dried-up streams, helping gather data on climate impacts on small watercourses.
- Tree-planting initiatives and forest ecosystem management (UNSA): by the Faculty of Forestry aim to promote biodiversity and ecological awareness.
- Student and staff competitions (JU): Calls for small-scale water retention ideas, green roof/wall designs, and eco-innovation are regularly held to encourage engagement.
- World Water Day & school outreach (UP): The Green UP program co-organizes visits to wastewater plants and interactive workshops with local schools to raise awareness on water sustainability.
- Viticulture and botanical research (UP): UP maintains a 30-ha vineyard with a gene bank and a botanical garden with over 8,000 species, including thematic zones like the “fairy garden” and medicinal herb collections.

GREEN CONSTRUCTION

Universities integrate green construction principles into campus planning, building design, and renovation projects. They focus on **energy efficiency, biodiversity, student engagement, and smart technologies**. Certified building standards, nature-based solutions, and innovation ensure the long-term sustainability of infrastructure and the well-being of campus communities.

Here is a list of best practices of examined universities in this area:

1. Sustainable building renovation and construction

- Eco-friendly renovations and modernisation (UoM, JU, MU, UP, JSU): Universities invest in sustainable upgrades of existing buildings, including insulation, smart shading, and ventilation systems to improve energy efficiency and reduce environmental impact. Despite the FEI faculty building being under monumental protection, JSU implemented sustainability upgrades such as internal heating automation and solar installations where permissible.
- Certified green construction (MU): MU applies BREEAM IN USE and incorporates sustainability assessments in all building investments. Measures include solar panels, thermal insulation, green roofs, heat pumps, and CO_2 management systems.
- Energy-saving design features (UP, MU): Passive cooling, large glazed surfaces, natural lighting, and shading systems help reduce the need for artificial air conditioning and lighting.
- BioPharma Hub (MU): A multi-functional, sustainability-focused research and teaching complex featuring geothermal boreholes, PV panels, waste heat recovery from data centres, skylights, a 245m³ water tank, and vegetated façade slats.
- Smart campus vision (MU, UP): Long-term strategies aim to implement more SMART buildings, reduce energy demand, and adopt carbon-neutral technologies.

2. Green infrastructure and landscape

- Expansion of green areas (MU, JU, UoM): Universities develop biodiverse outdoor spaces for both recreation and education, including native landscaping and open gardens.
- Green roofs and vegetation-integrated architecture (MU, UP): Rooftop gardens act as thermal insulators, manage stormwater, and support biodiversity and aesthetic campus value.

- Urban planning and community gardens (JU, UoM): Universities support sustainable urban planning and maintain green community spaces that enhance local ecosystems and social cohesion.

3. Research, education and innovation

- "Lungs of the City" – Solar Decathlon project (UP): UP's award-winning eco-positive housing concept combines sustainable architecture with social and environmental responsibility, demonstrating a holistic approach to zero-emission living.
- "Design your own eco-house" student competition (UP): A nationwide student contest promoting natural materials (straw, adobe), rainwater recycling, and green roofing. The initiative supports creative exploration of sustainable building culture.
- Sustainable urban planning engagement (UoM): The university takes part in applied projects that integrate green design principles into the broader urban fabric.

SUSTAINABLE IT INFRASTRUCTURE

Universities invest in digital transformation to reduce environmental impact, enhance operational efficiency, and foster responsible technology use. Key areas include **energy-efficient hardware, cybersecurity, paperless administration, and research-driven innovation**. These efforts support resilient, secure, and inclusive digital campuses.

Below is a greater detail of the practices of universities.

1. Paperless administration and digital services

- Paperless University concept (UP): UP implements a wide range of custom-developed solutions to reduce paper use and streamline processes, including:
  - e-form access module: online parking permit system for employees and guests.
  - event registration portals: platforms for concerts, alumni meetings, sports events, and family programs.
  - conference portals: tools for digital brochures and participant registration at academic conferences.
  - electronic inventory system: mobile-enabled tracking and authentic documentation of university assets.
  - e-purchase orders (UP): SAP-based workflows for paperless order approval, digital signatures, and supplier communication.
  - electronic document storage (UP): SAP content server for structured, database-based storage and document linkage.
- EDUC course catalogue (UP): international course management system developed under the EDUC alliance, enabling digital inter-university registration and course sharing.

2. Energy-efficient and secure IT systems

- Energy star-certified devices (UP): All computers used at UP meet energy efficiency standards and support multiple power-saving states (off, sleep, idle).
- Smart campus safety systems (UP): Advanced IT-supported security includes surveillance, fire alarms, panic buttons, and detailed protocols to ensure physical and digital resilience.
- Digitally supported energy efficiency (JSU): The university's dormitory and faculty buildings were equipped with energy-saving lighting and smart sensors. Digital systems reduce paper use and support administrative efficiency.

3. Research and innovation in IT resilience

- CERIT – Center for IT education and innovation (MU): MU's flagship IT center advances research in digital resilience, security, and innovation, aligning IT development with sustainability goals.
- CyberSecurity Hub (MU): Collaborative project with CTU and Brno University of Technology to build secure, sustainable digital infrastructure, addressing long-term resilience against cyber threats.
- JU Climate Council IT Guidelines (JU): JU published strategic recommendations on building sustainable IT infrastructure as part of its climate governance framework.

4. Digital learning and information systems

• DMS, E-Index, and e-learning platforms (MU, UoM): University of Montenegro streamlines learning and administration through digital management systems and online education tools, reducing reliance on printed materials and enabling remote access.

SUSTAINABLE EDUCATION

Universities are integrating sustainability into education through **curriculum reform, interdisciplinary programs, lifelong learning, and active student participation**. This fosters critical thinking, innovation, and social responsibility among students, equipping future leaders with the knowledge and skills needed for sustainable development.

Here is a list of best practices across universities:

1. Curriculum integration and thematic courses

- University-wide integration (MU, UP, UoM, UNSA, JSU): At MU over 2,000 sustainability-related courses are offered across all faculties and study levels, embedded into both specialized and common curricula. At UP courses related to sustainability are present in all faculties, covering topics like environmental law, renewable energy, circular economy, and smart technologies. At UoM over 40 bachelor, 30 master, and 10 PhD programs include sustainability content in fields such as engineering, economics, law, and environmental science. UoM has courses on energy efficiency, biodiversity conservation, eco-tourism, and environmental protection, that prepare students for green careers. At UNSA sustainability is being integrated into academic programs through initiatives like the Erasmus+ STEPS program (Faculty of Agriculture) and the PELMOB initiative (Faculty of Traffic). At JSU several faculties incorporate sustainability themes such as climate change, ESG, and circular economy. Industrial visits (e.g. Heineken) showcase sustainable operations in practice.
- Sustainability degrees and doctoral programs (JU, UoM): Programs include Sustainable Development PhD, Maritime Environmental Protection (international joint master's), and new courses on climate science and knowledge dissemination (JU Climate Council, 2025).

2. Interdisciplinary and international programs

- Global collaboration (MU): International programs like the Environmental and sustainability education master's, developed with universities in Germany, Austria, and Sweden, promote cross-border knowledge exchange.
- Joint programs (UoM): The maritime environmental protection and management master's program is delivered in collaboration with international partners and focuses on marine sustainability.

- Cross-disciplinary workshops (UP): Open professional workshops foster synergies between disciplines and create spaces for applied sustainability learning.

3. Pedagogical and digital support

- CERPEK (MU): Masaryk University's Centre for pedagogical competence systematically improves the teaching skills of university educators, especially in the area of sustainability education.
- Blended learning development (UP): The "White paper on digital education and learning support" promotes the use of digital tools and flexible methodologies to improve sustainability-related teaching effectiveness.
- MjUNIon and University of the third age (MU): Public-facing platforms offer education on climate change and sustainability to children, seniors, and lifelong learners.
- MOODLE and AIS-based education (JSU): Course materials and administration are handled digitally, significantly reducing paper use and increasing transparency.

4. Student engagement

- Student-led initiatives (UoM): Green clubs, sustainability hackathons, innovation competitions, and awareness campaigns empower students to take an active role in shaping campus sustainability.
- Participation in climate events (JU): Students and staff are invited to attend climate-focused conferences and workshops to foster academic-community collaboration.

More about this topic in last chapter –Social engagement and awareness.

SUSTAINABLE RESEARCH

Universities actively contribute to sustainability through **interdisciplinary research, innovation, and knowledge transfer**. These initiatives address environmental, social, and economic challenges by aligning with global goals, engaging in collaborative projects, and fostering science-policy-industry dialogue.

Below you can see what practice each university chooses.

1. Interdisciplinary research centres and hubs

- UoM has a strong network of research centres, that includes the Institute of marine biology (marine protection), Institute for advanced studies (climate research), and Centre for energy efficiency (sustainable architecture). UoM also hosts Ulysseus Innovation Hubs focused on socio-ecological sustainability and smart urban mobility.
- UP hosts the National laboratory for renewable energies, focusing on hydrogen technologies and carbon storage. This autonomous unit coordinates national R&D activities and leads the Baranya hydrogen ecosystem program, aiming to transform Pécs into a living lab for hydrogen mobility.
- MU supports interdisciplinary research via faculty-led centres addressing energy vulnerability (SDG 7) and social inequality (SDG 10), with dedicated infrastructure for research data sharing.
- JU supports sustainability through the Kraków Centre for Climate Education and by hosting lectures, seminars, and international sustainability-themed research events.

2. Participation in national and international research projects

- UoM engaged in over 15 EU and regional sustainability projects, including SmartWB and IoT-ECO, targeting green urbanism, smart technologies, and maritime sustainability.
- JU is active in national and international sustainability projects, leveraging collaborations to expand research impact.
- MU aligns its projects with the UN SDGs and contributes to national infrastructure such as the National repository platform (2024), which facilitates open science and research data management.
- UP leads research in environmental engineering, hydrogen storage, energy-efficient buildings, water policy, and medical sciences, integrating applied and theoretical approaches.

3. Research themes and focus areas

- UoM focus areas include marine ecosystems, energy efficiency, climate resilience, and green cities.
- JU covers a broad sustainability agenda through institutional events and research-linked education.
- MU's themes include energy justice, social inequalities, and SDG-aligned societal challenges.
- UP's priority areas include wastewater treatment, stormwater retention, acoustic comfort, fuel cells, and hydrogen-based public transport.
- UNSA's ongoing research projects focus on renewable energy, sustainable food systems, and electric mobility, often driven by participation in Erasmus+ and other international programs.
- JSU conducts applied research on circular models and sustainability in business, with outputs integrated into teaching.

4. Collaboration and knowledge transfer

- UoM promotes sustainability research through academic conferences like MICEB and GEA, enabling partnerships between academia, government, and industry.
- UP serves as a regional driver for knowledge transfer in hydrogen technologies, offering replicable models for cities transitioning to green economies.
- MU & JU foster knowledge exchange through public events, community outreach, and open access initiatives.

SOCIAL ENGAGEMENT AND AWARENESS

Universities foster social responsibility and sustainability awareness through **campaigns, volunteering, inclusive initiatives, and partnerships with communities**. These activities engage students and staff beyond the classroom, creating a culture of civic engagement and environmental consciousness.

1. Awareness campaigns and volunteering

- Campaigns and clean-ups (UoM, UNSA, JSU): Universities organize climate action weeks, biodiversity days, recycling campaigns, and tree-planting events involving students and staff. At JSU students organize regular clean-up events around dormitories.
- Green events and thematic campaigns (UP, JU): Initiatives like Earth Day celebrations, Green Gastronomy Month, and "Not a Drop!" oil collection raise ecological awareness.
- Ethical recognition (MU): The Roger Scruton Medal honors defenders of human dignity and reflects university values.

2. Stakeholder engagement

- Partnerships (UoM, MU, JSU): Cooperation with schools, NGOs, and municipalities on sustainable tourism, citizen science, and environmental education. JSU organizes events for high school teachers focused on environmental education and sustainability awareness.
- Local initiatives (UP): Community-based events like European mobility week, Cycling breakfasts, and local produce campaigns link campus and city sustainability.
- Public education events (JU): Open lectures and seminars connect students, staff, and the broader community.
- Sustainability dialogues (UP): Events like Green Roundtables and the Green AURA Conference stimulate intergenerational and interdisciplinary dialogue on sustainability.

3. Student-led projects

- Student associations (UoM): Drive initiatives in green mobility, sustainable lifestyles, and inclusive education on climate and environment.
- ComMUNIty Fund (MU): Supports student-led projects like SustainMap (eco-mapping), upcycling workshops, and inclusive culture festivals.
- Artistic engagement (UP): Events like the Gicci Ricci EcoFashion Show or Green Dance encourage sustainability through art and movement.

4. Support for inclusion and well-being

- Inclusive infrastructure (MU): Services like the Teiresiás Centre and on-campus childcare facilities ensure accessibility and support for disadvantaged groups.
- Health and well-being promotion (MU): Initiatives cover topics from health literacy to financial education under the Healthy University umbrella.
- Green steps for health" (UP): Activities combining personal health and sustainability, like "Take the stairs" campaigns.

4. RECOMMENDATIONS FOR SCALING AND REPLICATION

Universities should **embed sustainability in long-term strategic plans and back them with dedicated governance structures, such as sustainability offices, councils, or interdepartmental working groups.** Dedicated budgets for green initiatives and participatory mechanisms (like student funds or faculty incentives) can enhance ownership and ensure meaningful engagement. Internal communication must be strengthened, using platforms such as newsletters, dashboards, and regular sustainability reporting.

Establishing **formal regional sustainability networks** can foster exchange of know-how, policy alignment, and joint funding opportunities (e.g., Interreg, Erasmus+). Universities can lead city-wide green initiatives through joint planning with municipalities and regional authorities, leveraging shared infrastructure (e.g., cycling routes, energy communities). Cross-border collaboration in the Visegrad and Western Balkans regions should be encouraged to standardize approaches to monitoring, curriculum development, and campus design.

All green initiatives should be guided by European frameworks like **the EU Green Deal, Climate Law, and Sustainable Development Goals (SDGs)**. National policy mechanisms, including carbon pricing and energy efficiency laws, must be closely monitored to adapt campus infrastructure. Universities should also proactively **engage in policy development** through research-based recommendations and strategic partnerships with relevant ministries and agencies.