



## The Activities of Eszterházy Károly Catholic University in the Field of Sustainability

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**Abstract.** The Eszterházy Károly Catholic University is an innovative, service-oriented university that responds to the needs of regional economy and labor force. The University considers the sustainability as core value, the element of sustainability appears in the field of its educational, research and third mission activities.

The Sustainable Development Strategy of the University was accepted in 2021, however the principles of sustainability have been appeared in the Organizational and Operational Regulations of the University dated 2016. The Sustainable Development Strategy provides the framework of activities which are contributing to reach the sustainability goals of the university. The main objective of the Article is to present these activities.

### Keyword:

Green university, sustainable viticulture, principles of sustainability in education, decarbonization, green transition

### 1. Introduction

The Eszterházy Károly Catholic University (EKCU) has a long history, it was founded in 1774, now it is a determinant actor of the Hungarian higher education sector. It has five faculties (Faculties of Pedagogy, Faculty of Humanities and Arts, Faculty of Natural Sciences, Faculty of Economy and Social Sciences and Faculty of Informatics) and two doctoral schools.

The Eszterházy Károly Catholic University is a forward-thinking, customer-focused organisation that pays close attention to the needs of the regional workforce and

economy. Sustainability is ingrained throughout all the organization's initiatives in education, research, and community participation. Three main elements make up the University's comprehensive Sustainable Development Strategy, which was approved in 2021: a thorough examination of the current situation, lofty targets for the year 2030, and the necessary steps to achieve these goals. Further demonstrating its dedication to environmental responsibility and societal well-being, the University actively participates in the Sustainability Platform for Hungarian Universities.

EKCU plays a leading role in teacher training and further education in Hungary. The University has developed the Complex Basic Program<sup>2</sup> applied in the 'Experience School' network; the Program pays special attention to sustainability. The analysis of the causes of climate change is an important element in the bachelor/master's programs and in the Doctoral School of Educational Science.

The Research and Development Centre of the University operates as a platform for entrepreneurial higher education. The Centre carries out research activities in the field of viticulture and winemaking, which contribute to sustainable farming in the entire Carpathian Basin. Building on this innovative activity, the University offers a wide range of services.

The University takes on a crucial role in advancing the country's strategic goals for CO<sub>2</sub> emission reduction. The University actively participates in a LIFE project designed to support the green transformation of the Northern Hungarian Coal Region as a consortium partner. Pioneering in its endeavors, the University houses the Coal Commission Secretariat, which acts as the operational center for the Coal Commission, Hungary's first dialogue platform for coal transition-related issues. This demonstrates the University's commitment to promoting environmentally sound practices and regional and global progress.

Over the past decade, sustainability has been the key driver of infrastructure development: building C\* is a renovated public building, operates as the first active house in Hungary, which produces more energy, than it consumes.

## **2. Discussions**

The main objective of this section is to provide an overview of sustainability activities, which are grouped into four main categories: 1. Education, 2. Research and development, 3. Regional development, and 4. Infrastructure. These activities are all align with the mentioned Sustainable Development Strategy of the University.

### **2.1. Education**

Sustainability has long been emphasised in a wide range of educational programmes at the Eszterházy Károly Catholic University and its predecessor institutions. Among these, it is important to draw attention to the environmental science majors that have remained a mainstay of our curriculum for many years.

The National Environment and Nature Protection Office unveiled an ambitious plan to establish a network of training facilities for environmental and nature protection in 1980. This proposal's main goal was to bring together experts in the field of environmental education, provide them with opportunities for advanced training, and eventually increase the efficiency of their campaigns to raise environmental consciousness. In 1986, the first training facility of this kind was constructed as part of the College in Eger. Its main goals were to organise and coordinate student environmental and nature protection-related activities and to promote environmental education and ongoing professional

development for aspiring teachers, especially those who would work in urban schools.

The Institute launched specialised teacher training programmes in environmental protection in 1992 in response to the growing significance of environmental education. The objective was to create educators and teachers who would excel in environmental education across kindergartens and public educational institutions. They were entrusted with instilling the knowledge, attitudes, and viewpoints necessary to promote ecologically conscientious behaviour, which went beyond merely giving facts.

There is currently a Bachelor of Science (BSc) degree programme in environmental science based within the Department of Environmental Science and Landscape Ecology. This programme provides specialised tracks in waste management as well as nature research, the latter of which is also accessible in a dual format, giving students a thorough and adaptable educational experience.

The geography programme is another essential Bachelor of Science (BSc) programme that makes a substantial contribution to sustainability. The promotion of environmental awareness and sustainability principles among students within this programme depends heavily on the "renewable energy resources" specialisation.

The geography programme is the only discipline master's degree (MSc) programme offered by the Faculty of Science, and it has been running since 2012. The "resource and risk analysis" specialisation stands out particularly among its different specialisations. The main goal of this specialisation is to develop professionals who are skilled at managing a variety of ecological, social, and economic hazards as well as the abilities required to plan, manage, and oversee the sustainable utilisation of various resources. Importantly, the MSc programme strongly emphasises tackling issues related to climate change.

For the "Z" generation, a revolutionary educational programme called the "Z" training programme has recently been developed. This autonomous master's programme, which prepares graduates to become teachers, has a distinctive stance towards teaching environmental and natural science. It attempts to explain the different occurrences and processes of the natural world by presenting it as an integrated, complex whole. The "Z" training programme functions in a genuinely multidisciplinary manner, encouraging cooperation between all institutions within the University's Faculty of science.

An Environmental Education module has been formed within the scope of the Doctoral School of Education, providing chances for PhD studies to both Hungarian and foreign students. In-depth discussions of science education, sustainable development, landscape management, and environmental preservation are covered in this subject. It offers in-depth examination of subjects like the development of modern ecological approaches and the pedagogy of environmental risk management.

Eszterházy Károly Catholic University is creating its own Green Diploma Programme. This programme offers an exciting opportunity to students from a variety of academic backgrounds. This all-inclusive strategy strives to involve a diverse group of students in sustainability initiatives and promote environmental awareness among university students. A student who receives a Green Diploma is certified as having gained a thorough comprehension of fundamental scientific concepts in environmental preservation and sustainable development at the university level. Students who complete this programme successfully are given a special professional certificate or diploma that distinctly recognises their knowledge of environmental issues. The Green Diploma can be obtained by registering for and successfully finishing courses that include sustainability and climate

protection concepts as part of the University's existing curriculum. The "green diploma" will be awarded to graduates who have earned a minimum of 20 credits from these approved courses.

## **2.2. Research and development**

With a core concentration on viticulture, oenology, environmental research, and biotechnology, the Catholic University Research and Development Centre (RDC) is actively involved in research and development projects throughout several domains. These focus areas highlight the institution's dedication to ethical and environmentally conscientious practises by carefully tying into the broader ideals of sustainability and environmental protection.

Fulfilling current social demands while protecting future generations' ability to meet their own needs is the goal of sustainable viticulture. We are committed to developing viticultural sustainability research through a diverse approach in order to achieve this goal. This strategy incorporates a multidisciplinary viewpoint and takes into account elements including soil health, land features, the grape microbiome, grape diseases, and methods for preventing and treating them. We actively encourage cooperation with our industrial partners, working together to address the issues they are currently facing in the industry.

The study of fungal pathogen biology in grapes and the assessment of fungicide resistance to drive practical crop protection advancements have been two of the most significant and productive fields of research over the past ten years in terms of environmental sustainability. The development of environmentally friendly methods for crop protection has been directly affected by the systematic monitoring of illnesses resulting from climatic stress and infections caused by new pathogens as a result of climate change.

Our institute has also conducted a thorough investigation into the phytochemical characteristics of horse mint and other medicinal plants. This study has the potential to make a substantial impact on the creation of cutting-edge plant conditioning techniques that are especially pertinent to the production of grapes. With the help of these technologies, crops can live as long as possible, be more disease-resistant, and have fewer pathogens proliferate on their surfaces. We are creating horse mint-based solutions with natural components to do this. These initiatives support our dedication to environmental sustainability and agricultural innovation.

The security and productivity of many crops, including grapes, are seriously threatened by climatic extremes because they leave these plants vulnerable to a variety of plagues and diseases. Even though these illnesses may not always lead to the total devastation of the infected vines, they frequently cause decreased yields. Enhancing the safety and sustainability of grape production is the focus of our ongoing research projects.

The Environmental Microbiome Research Group of the Research and Development Centre is a leader in ecological study, particularly in the area of soil and plant microbiomes. Their efforts have been recognised on a global scale for their contributions to our understanding of these complex ecosystems. Their research's preliminary findings highlight the significant impact of environmental conditions on the makeup of both soil and plant microbiomes. These findings demonstrate that climatic factors and soil's physical and chemical qualities play a key role in determining the structure and diversity of the microbiome through rigorous comparison with environmental variables. Notably, their study has illuminated the relationship between the characteristics of wines and the

make-up of microbial communities. This realisation has resulted in the recent introduction of the idea of "microbial terroir" as a crucial component of the long-established idea of "viticultural terroir."

We have created an interpolated gridded dataset of climate models for our research, which explores the relationship between model-based climatic scenarios and site suitability. This dataset, which covers the years 1950 to 2100, is a useful tool for understanding the regional effects of climate change. Through our exclusive online geospatial information system, the output maps from our research are available. In addition, we have promoted global cooperation in order to develop an open-source web-based geospatial information system. All our geographical data, along with the required base maps, are now easily accessible to the public thanks to this platform. Visit [gis.uni-eszterhazy.hu](http://gis.uni-eszterhazy.hu) to explore this resource, which improves access to and dissemination of important knowledge about climate modelling and its effects on the environment.

Over 200 unique indigenous grape types have been chosen and are being grown in experimental plantations by the Centre of Excellence for Grape and Wine, which is located within the Research and Development Centre. Through this project, the potential of these grape types for use in winemaking and research will be explored.

The institute has also built a sizable gene bank that houses a collection of more than 1,000 grape varieties in addition to this endeavour. In addition to protecting the genetic diversity of these grape cultivars, this genetic archive is an important tool for ongoing viticulture and oenology research and development.

Agriculture as well as the production of wine and grapes are both being impacted by climate change. First of all, it has caused several grape varieties' ideal growing zones to relocate further north, requiring modifications to production techniques. Second, the need of creating resilient vineyards that can endure these difficulties has been highlighted by the increased harsh weather conditions brought on by climate change.

Switching to non-native grape varieties that are more tolerant of the changing climate is one strategy for reducing the consequences of climate change. However, this change poses a risk to the wine business because it can cause the traditional grape varieties to be quickly replaced, which could have an effect on the industry's identity and consumer preferences.

The Research and Development Centre is prepared to significantly contribute to sustainability. This comprises:

1. **Advancement of Plant Protection and Conditioning Technologies:** The Centre is committed to developing innovative plant protection and conditioning technologies that harness the power of natural components. These eco-friendly solutions are designed to reduce the ecological footprint of agriculture while enhancing crop health and productivity.
2. **Expansion of Ecological Research Across Diverse Landscapes:** The Centre's research initiatives span a range of various terrain contexts. It increases our understanding of complicated ecosystem processes and informs more sustainable land management practises by performing ecological studies in these various settings.
3. **Creation of Spatial Databases for Sustainable Agriculture:** The Centre actively participates in building and maintaining spatial databases specifically designed to meet the requirements of sustainable farming. These databases provide essential data for well-informed agricultural decision-making, promoting resource efficiency, responsible land use planning, and environmental preservation.

Through these varied activities, the Research and Development Centre is ready to demonstrate a dedication to comprehensive and ethical research practises and advance sustainability in agricultural and environmental conservation.

### **2.3. Regional development**

The university is a key player in the development of the region, and it is driven by a strong commitment to sustainability. The Department of Geography and its partners' successful grant proposal from 2012 serves as an impressive illustration of this dedication. The project was given the go-ahead by the appropriate authorities and was titled "The links between renewable natural resources and climate change: Interrelationship between renewable energy and climate change for the development of a sustainable model region cooperation" (TÁMOP-4.2.2.A-11/1/KONV2012-0016).

The main goal of this project was to create a model region with 23 municipalities that concentrated on the effective use of energy resources. The creation of an online Geographic Information System (GIS) database was a notable project outcome. This extensive database included evaluations of the potential for renewable energy sources as well as a wide range of geographical data. The project has helped the area adopt sustainable development practises and informed decision-making by offering a central platform for obtaining and analysing this important information. The university's commitment to promoting sustainability and its active involvement in regional development are both highlighted by this programme.

The Eszterházy Károly Catholic University is essential to achieving the country's strategic goals for lowering carbon dioxide emissions. Notably, the university is the only institution of higher learning actively involved as a crucial consortium partner in the LIFE integrated project, known as LIFE-IP North-HU-Trans, led by the Ministry of Energy. With a specific focus on enabling the green transition of the Northern Hungarian Coal Region, this project is strategically connected with the implementation of the National Energy and Climate Plan. A ground-breaking project in Hungary is the Hungarian Coal Commission, which was founded in 2021 as a component of the LIFE-IP North-HU-Trans project. It acts as the first national venue for consultation on the difficulties and possibilities brought on by the move away from coal. The Coal Commission's main goal is to offer a cooperative venue for conversations among various stakeholders, promoting a just and sustainable transition for the North Hungarian region.

Eszterházy Károly Catholic University hosts the Coal Commission Secretariat (CCS), the Coal Commission's administrative arm. By managing the professional coordination of activities related to the university's participation in the LIFE-IP initiative, the CCS plays a crucial part in the project. Additionally, it actively promotes the Coal Commission's operation. The CCS's goal also includes locating and involving stakeholders who will be directly touched by the transition, keeping in constant contact with them, and including them in the formulation and implementation of the transition process. This open-minded and cooperative approach guarantees that the transition away from coal is not only successful but also takes into account the needs and viewpoints of all relevant stakeholders, ultimately resulting in a more just and sustainable future for the area. In the framework of LIFE project, we are implementing awareness raising activities, because we believe that we have to start the awareness raising activities among children as soon as possible. This is the reason, why we have organized twice the Green Week at EKCUC, which is a series of climate awareness raising activities.

The European Commission recognized that the transition to the climate-neutral

economy will affect the regions of Europe in a different way: regions hosting heavy industries, implementing carbon intensive activities will be affected on a higher extent. This is the reason why the Just Transition Mechanism were created involving the Just Transition Fund, which will ensure that nobody left behind<sup>5</sup>. In Hungary there are three counties, which are eligible to receive support from Just Transition Mechanism. The precondition of this is the approval of the Territorial Just Transition Plans (TJTPs) which provides the framework of the transition. The university contributed to the development of TJTPs of Heves and Borsod-Abaúj-Zemplén counties by mapping the stakeholders, involving them to the process and implementing the need assessment.

The CCS invests a lot of energy in building international connections with other coal regions and being in the mainstream of the just transition, in align with these ambitions the CCS has a first circle membership in Horizontal Stakeholder Strategy Working Group of Just Transition Platform. This working group has a cross-cutting nature and focuses on the identification and assessment of approaches and good practices to engage all stakeholder groups<sup>5</sup>.

#### **2.4. Infrastructure**

The buildings of the Eszterházy Károly Catholic University have a total floor area of 80 071 m<sup>2</sup>. In the year 2021, the University used approximately 108 183 830 m<sup>3</sup> of natural gas to heat these buildings. The highest energy consumption per m<sup>2</sup> is for the Érsekkert building, while the lowest is for the Sas Street Dormitory. The annual electricity consumption of the total building stock in 2021 was 1 995 988 kWh, which means 25 kWh consumption per m<sup>2</sup> per year. In terms of electricity consumption, the Wine Research Building, the buildings on Leányka Street and the Lyceum have the highest electricity consumption per unit area.

In terms of the used energy mix, nuclear energy has the highest share, followed by fossil energy. The share of renewable energy is 14.7% and is expected to increase due to future investments.

Eszterházy Károly Catholic University pays special attention to the development of energy efficiency of its buildings. In recent years, the replacement of the windows and doors of the dormitory on Sas street and the thermal insulation of its facades was carried out. 36 kVA capacity of solar PV panels was also installed to the flat roof of the building. The Delta building on Leányka Road has been completely renovated, with new windows and doors, a new heating and cooling system, and insulation of the facade and ceiling. The building now meets the highest energy standards.

The C\* building has also been completely renovated in terms of energy efficiency, including the replacement of windows and doors, insulation, and technical renovation. Building C\* is the first renovated public active house in Hungary, it produces more energy than it consumes. As a result, the building has won the Media Special Award for Architecture and the Cultivated Environment Award.

The energetic renovation of Building "B", the Training School and Building "E" was carried out included the replacement of windows, the insulation of the roof structure and the facade, the installation of a heat pump, a condensing boiler and thermostatic valves. To increase efficiency, a solar panel system was also installed on the roof of building "D". The renovation of the Almagyardomb Dormitory will include the replacement of windows and doors, insulation, and the replacement of the gas boiler, as well as the installation of sub-meters.

Currently, the University has solar panels on the Leányka Street buildings and on the

Sas Street Dormitory with a total capacity of 229 kVA. The University is planning further investments in technical installations in its buildings (Table 1).

Table 1.

Table 1. The planned investments

Buildings in Eger	Lyceum	Replacement of 3 conventional boilers with condensing boilers
	Buildings on Leányka Road	Controls in the central boiler room and heat center, replacement of obsolete boilers
	Sas street dormitory	Replacement of boiler, installation of control systems, replacement of boiler house main pipe, replacement of hot water container
Buildings in Jászberény	Main building	Replacement of additional boiler with condensing boiler
	Dormitory	Replacement of 2 outdated boilers
	Apartment buildings	Replacement of 24 boilers
	Sports centre	Replacement of 2 boilers

#### 4. Concluding remarks

We believe that the successful implementation of the 2030 sustainability ambitions described in the Sustainable Development Strategy will lead to institution that can set an example as a green university in higher education and can also transmit positive messages to the environmentally conscious youth.

For the effective implementation of our sustainability ambitions, it is essential to involve the university staff and students as widely as possible: the university community has to be committed to consider the sustainability priorities, and to be willing to be part of the green university. We are confident that in the adopted Sustainability Development Strategy everyone can find a field of expertise that they feel passionately about and want to do something about to achieve the goals.

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