PYRAMID MODEL OF THE SUSTAINABLE UNIVERSITY AND ITS IMPLEMENTATION PROGRAM

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Abstract　　The University of Sopron has created the Sustainable University Model of the University of Sopron (SUM-UoS) based on its best practices, applying a systemic approach based on sustainability criteria. In its Institutional Sustainability Strategy, the university defines its vision and SMART goals, for which it assigns an Implementation Program. The model supports the implementation, operation and continuous development of the Sustainable University. It also lays the foundation for all those strategic steps that go beyond theory and put sustainability, environmental protection, and conscious and voluntary protection into practice. The SUM-UoS is embodied in a pyramid model, with the application of the model we aim to create a university operating culture that treats sustainability as a priority. With the help of implementers and interested parties, the culture related to university sustainability can continue to spread not only in higher education, but also in other sectors and in a wider social circle. Users can implement the recommended best practices and projects of the University of Sopron, in their own organizational environment, in a customized way. Based on the Sustainability Strategy, the University of Sopron announced the "Sound of Earth University of Sopron" Implementation Program (UoS-IP) under trademark protection. The implementation program of measures is in line with the UN Sustainable Development Goals (SDGs), but the UoS-IP provides more than mere SDG compliance. It provides a framework for the complex implementation and continuous development of the institutional sustainability culture. The UoS-IP contains thematic work packages based on the SDGs.

Keywords　　Sustainability in practice, Pyramid Model, Sustainable University, Implementation Program

EL MODELO PIRÁMIDE DE LA UNIVERSIDAD SOSTENIBLE Y SU PROGRAMA DE IMPLEMENTACIÓN

Resumen　　La Universidad de Sopron ha creado el Modelo Universitario Sostenible de la Universidad de Sopron (SUM-UoS) basado en sus mejores prácticas, aplicando un enfoque sistémico basado en los criterios de sostenibilidad. En su Estrategia de Sostenibilidad Institucional, la universidad define su visión y metas SMART, para las que asigna un Programa de Implementación. El modelo apoya la implementación, la operación y el desarrollo continuo de la Universidad Sostenible. También sienta las bases para todos los pasos estratégicos que van más allá de la teoría y que ponen en práctica la sostenibilidad, la protección del medio ambiente y la protección consciente

y voluntaria. El SUM-UOS se materializa en un modelo piramidal, con la aplicación del modelo pretendemos crear una cultura operativa universitaria que trata la sostenibilidad como una prioridad. Con la ayuda de los implementadores y las partes interesadas, la cultura relacionada con la sostenibilidad universitaria puede continuar difundiéndose no sólo en la educación superior, sino también en otros sectores y en un círculo social más amplio. Los usuarios pueden implementar las mejores prácticas y proyectos recomendados de la Universidad de Sopron, en su propio entorno organizacional, de forma personalizada. Basado en la Estrategia de Sostenibilidad, la Universidad de Sopron anunció el Programa de Implementación "Sound of Earth University of Sopron" (UoS-IP) bajo la protección de la marca. El programa de implementación de medidas está en línea con los Objetivos de Desarrollo Sostenible (ODS) de la Organización de las Naciones Unidas, pero el UoS-IP proporciona más que el mero cumplimiento de los ODS. Proporciona un marco para la implementación compleja y el desarrollo continuo de la cultura de sostenibilidad institucional. La UoS-IP contiene paquetes de trabajo temáticos basados en los ODS.

Palabras clave   Sostenibilidad en la práctica, Modelo Pirámide, Universidad Sostenible, Programa de Implementación

1 Introduction

Many universities have set strategic objectives to ensure sustainable operations (Brundiers et al., 2021); however, various environmental, social, and economic conditions lead to distinct paths toward sustainable university operations (Salvia et al., 2019). According to Dlouhá et al. (2017), universities in the Central and Eastern European region – including Hungary – have had to abandon the ideologies of the pre-1990 system and orient their institutions towards green thinking. Comprehensive strategies that impact an entire institution appear most successful. According to Silova (2009), the sustainability performance of Hungarian universities is among post-socialist countries. Hungary joined the European Union in 2004, creating a broader opportunity for sustainable development and a green transition.

The University of Sopron hopes to serve as a model for other universities in Hungary and Central Europe (Fábián et al., 2023). The University of Sopron is a significant intellectual, educational, and research center in western Hungary. Centuries of tradition permeate education at the university's four faculties (Faculty of Forestry, Faculty of Wood Engineering and Creative Industries, Elek Benedek Faculty of Pedagogy, Sándor Lámfalussy Faculty of Economics). Also connected to the University of Sopron is the Forest Research Institute, founded in 1898. The research and development projects of the Institute – covering disciplines including ecology, silviculture, forestry breeding, forest protection, plantation-like tree production, and economics – serve sustainable forest management (Prins et al., 2023). Our university strives to shape natural, social, and human environments. Its activities aim to preserve and improve quality of life through an environmentally conscious mode of thinking (Urbański, 2020). The university nurtures moral and human values, and its operations and objectives work to improve the region and the country.

Sustainability is a key focus of the four university faculties and scientific institute. It also increasingly influences our day-to-day operations. Our university can engage in knowledge-intensive management and sustainable use of forest ecosystems (Hein & van Ierland, 2006; Chen, 2022) and the wood they produce in the most complex way,

which is the basis of a sustainable biomass-based economy. In addition to research in the natural sciences, climate adaptation, and engineering, our university addresses the complex sustainability issues in environmental education, pedagogy, economics, and social sciences.

We have implemented a curricular reform at our university by integrating an elevated level of sustainability in all our courses. Sustainability pervades the whole curricula of some courses (e.g., forestry engineering, wood engineering, environmental engineering, and conservation engineering). In others, it appears in blocks (e.g., wood architecture aspects of architecture, environmental education issues in early childhood education and kindergarten, and ecological economics aspects of economics courses).

The University of Sopron is an outstanding example of sustainability implementation in Hungary. It aims to make its activities available to partner institutions as best practices and is moving towards dialogue, knowledge sharing, joint sustainability courses, and peer learning through networking. The University of Sopron is a founding member of the Sustainability Platform of Hungarian Universities (SPHU, 2022), a group of Hungarian higher education institutions committed to implementing and achieving the 17 UN Sustainable Development Goals.

The university's motto – *Naturally with you* – reflects this attitude.

The University of Sopron decision-makers, including the green university panel, have created their own model.

2 Development of The Sustainable University Model of the University of Sopron

Mounting environmental pressures from pollution, climate change, inefficient resource use, waste management, ecosystem degradation, and biodiversity loss have affected social standards for sustainable development, transparency, and accountability, motivating organizations to adopt a systematic approach to support these efforts (Velazquez et al., 2006; Urquiza Gomez et al., 2015; Silva 2022; Menon & Suresh, 2022).

The Institutional Sustainability Strategy (UoS, 2019) presents the university's vision and SMART goals to which it assigns an Achievement Program. The model supports the implementation, operation, and continuous improvement of the Sustainable University through University actions and work packages (WP).

The university also lays the foundations for strategic steps that extend beyond theory and put sustainability, environmental protection, and conscious and voluntary conservation into practice. The pyramid model in Figure 1 shows the Sustainable University Model of the University of Sopron (SUM-UoS), developed in detail based on a logical structure. We aim to feed a university culture prioritizing sustainability. The arrows show the relationships between levels. With the help of implementers and stakeholders, this university-sustainability culture can spread within higher education, other sectors, and society. Implementers can administer recommended the university's best practices and projects in their organizational context in a tailor-made way.
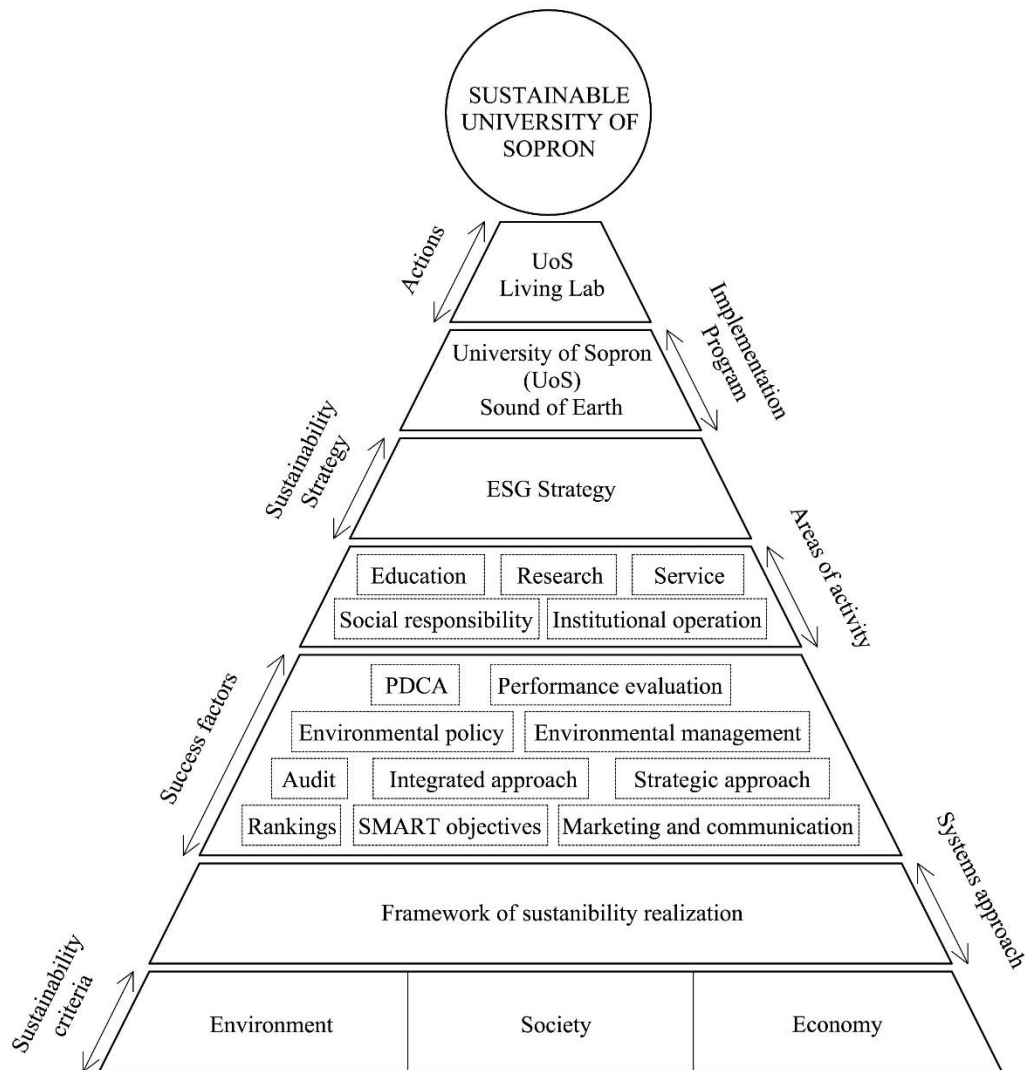
SUSTAINABLE UNIVERSITY OF SOPRON

Actions

UoS Living Lab

University of Sopron (UoS) Sound of Earth

Implementation Program

Sustainability Strategy

ESG Strategy

Areas of activity

Education | Research | Service

Social responsibility | Institutional operation

Success factors

PDCA | Performance evaluation

Environmental policy | Environmental management

Audit | Integrated approach | Strategic approach

Rankings | SMART objectives | Marketing and communication

Systems approach

Framework of sustanibility realization

Sustainability criteria

| Environment | Society | Economy |

Fig. 1 Pyramid model. The Sustainable University Model of the University of Sopron (SUM-UoS).

The University of Sopron Sustainable University Model rests on sustainability criteria (triple bottom line) (Jum'a et al., 2022) and systems approach. Concerning its environmental impact, the University of Sopron systematically integrates and defines itself in its physical, landscape, and organizational environment and stakeholder relations.

As a framework, the model continuously improves institutional environmental performance and contributes to sustainability pillars. Based on environmental management system components, the structure defines scope, roles, responsibilities, and authorities, establishes environmental policy, monitors and addresses compliance obligations, sets SMART targets, and provides support and resources. It also ensures documentation, readiness, marketing communication, and management review. Several success factors influence the Sustainable University Model of the University of Sopron (SUM-UoS) effectiveness, including management and staff commitment, a strategic approach, an integrated approach, applying the PDCA principle, the continuous improvement principle (ISO, 2015), the process approach, developing a conscious self-evaluation system, developing evaluation cycles, third-party validation, and environmental and sustainability performance assessment.

The University of Sopron is certified according to the international standard ISO 14001:2015 Environmental Management System (EMS). Environmental and sustainability benchmarking can occur in many ways. Successfully certifying an institutional environmental management system to the MSZ EN ISO 14001:2015 standard demonstrates compliance with the international standard requirements. The university must be able to compare the outcomes of its efforts with those of other higher education institutions on a national and international scale. Participation in international university sustainability rankings (UI GreenMetric, 2023; THE Impact Rankings, 2023) provides an excellent opportunity to do just that. The rankings employ a set of predefined indicators to measure and demonstrate performance, helping in the provision of responses to changing environmental conditions.

The model includes traditional university activities like teaching, research, service, third missions, and institutional operations. Transparent operation and economic sustainability according to environmental, social, and governance criteria, also known as ESG criteria, are vital (Khan, 2022; Baratta et al., 2023). A sustainable approach guides activities organized innovatively around ESG compliance and the UN Sustainable Development Goals (SDGs), with a significant thematic overlap.

Based on the Sustainability Strategy, the University of Sopron has launched the trademark-protected Sound of Earth University of Sopron Implementation Program (Figure 2). The implementation program aligns with the UN Sustainable Development Goals but goes beyond mere SDG compliance by providing a framework for the complex implementation and continuous improvement of an institutional sustainability culture.

Fig. 2 Protected trademark of the Sound of Earth University of Sopron Implementation Program

The Sound of the Earth University of Sopron Implementation Program includes thematic work packages based on SDGs (UN, 2015). The University as a Living Laboratory (Kumdokrub et al., 2023; Verbeek et al. 2023) framework includes the partnership work package (SDG 17); planet work package (SDG 6, 12, 13, 14, 15); people work package (SDG 1-5); prosperity work package (SDG 7-11); and peace work package (SDG 16). In action, the balance between theory and practice is paramount. The Living Laboratory Concept, which provides a framework for the work packages and action areas, is a vital element. The Living Laboratory Concept includes the multifunctional use of the green and built campus environment in the service of sustainability; students, teachers, mentors, researchers, and employees develop their ideas in a real environment and can test their implementation through feedback loops.

Table 1 summarizes the principal areas for action in each thematic work package.

Table 1 Areas for action in the Sound of Earth University of Sopron Implementation Program thematic work packages

The University as a Living Laboratory				
Partnership WP (SDG 17)	**Planet WP (SDG 6, 12, 13, 14, 15)**	**People WP (SDG 1-5)**	**Prosperity WP (SDG 7-11)**	**Peace WP (SDG 16)**
Strategy	Environment	Policies	Renewable energy	Moral
Organization	Plan documents	Training	Conditions	Individual
Dashboard	Transport	Library, databases	Finance	Performance evaluation
Network of relations	Institutional operation	Incentives	University welfare	Catalyst
Activity		Green Hygiene	Expert databases	Dissemination
		Community involvement	Procurement	
			Food/Nutrition	
			Outdoor activities	

The following explains the individual work packages.

The **"Partnership WP" (SDG 17)** work areas and related system components are also shown below. Developing a *sustainability mission statement and vision* element capturing the necessary philosophy and attitude is essential to the well-articulated representation of sustainability in the institutional **"Strategy"** and provides a framework for a university *sustainability strategy* reflecting an integrated approach.

An **"Organization"** responsible for sustainability is required to ensure efficient operation. Defining this requires documenting the *institutional sustainability story*, identifying the significant achieved and targeted milestones, and comprehending the foundation of sustainability identity. Meeting current and future needs requires a *sustainability panel* with a coordinating role implemented at the level of a designated responsible person or panel.

Data managers ensure that inventory data for sustainability performance indicators is always available in the organization. As sustainability ambassadors, the other responsible persons in the departments support the work. A *"Dashboard"* provides transparency, quantification, knowledge, awareness, and management based on measured data by making *public data on sustainability* (e.g., instantaneous trends in GHG emissions) available in time series or even in real-time.

A vast **"Network of Relations"** is critical to successful information exchange and collaborative efforts. Global thinking could occur at the international level, while local action can occur at the university–city–region level (Vinogradova et al., 2020). Whether general or specific, the **"Activity"** section of a university profile outlines the achievable sustainability efforts. Performance is developed along the specificities of the main activities of *sustainability teaching, learning, research, awareness, and service*. The University and *Community Plan Documentation System (Master Plan)* provides a systematic and methodical approach and comprehensive activity planning. A*s a system theory of the Living Lab Concept*, the university sets the stage for concrete implementation, which can be intricately linked to various *campaigns* (Alsaati et al., 2020) (e.g., special days, TeSzedd! – voluntary waste collection movement).

The following characterize the **"Planet WP" (SDG 6, 12, 13, 14, 15)** activity areas. The institution also positions itself at the level of environmental complexes and systems to

comprehend a sustainable **"Environment."** *The development of a green environment, the enhancement of nature positivity and biodiversity* at the natural environment level, *the continuous improvement of infrastructure* at the artificial environment level, and the system elements of *landscape-level sustainability research* at the environmental system level provide the opportunity for a complex approach.

Various **"Plan Documents"** connect to the *Master Plan*, including the *Sustainability Report* (Caputo et al., 2021), *Land Use Plan, Climate Strategy, GHG Inventory, Carbon Footprint Calculation, Carbon Neutrality, CO2 Reduction Plan, Climate Action Plan* (Malthan-Hill et al., 2019), *Watershed Strategy* (Li et al., 2022), *Waste Management Plan, and Zero Waste Action Plan* (Hannon et al., 2019).

"Transport" is responsible for the direct, diffuse environmental impacts and the indirect background impacts. Optimizing areas for *sustainable (public) transportation* (Luttik & Maters, 2022), *commuting, posting, car-free and pedestrian-friendly campuses, zero-emission vehicles, carpooling* (Werkmeister et al., 2021), *business air travel*, and increasing efficiency should be prioritized.

In addition to traditional university activities, sustainable **"Institutional Operations"** mandate several tasks to achieve the lowest possible environmental impact from operations. In addition to *conscious institutional waste management, separate collection* (Gulyás & Veres, 2023), *and composting* (Saalah, 2019), emphasis should fall on *reuse, prioritizing durable products, and eliminating paper and plastic* (Gherheş et al., 2021). In the fight against global warming, *institutional climate protection and adaptation*, conscious *institutional energy management* (Javed, 2021)*, and enhancing energy efficiency are* priorities and significant economic issues. Sustainable water management entails reviewing *institutional water management, water conservation, rainwater retention* (Pachamuthu, 2021), *water protection,* and *wastewater management*. Along with the *green building guidelines* (Abdelalim et al., 2015), good orientation, natural ventilation, natural lighting options, and air conditioning through a green environment enable a variety of advantages. The system element of *sustainable consumption* (Castillo Longoria et al., 2021) allows and plans for careful resource management.

The **"People WP" (SDGs 1-5)** appear below. The institution should reconsider its human-related policies – including *child protection, maternity and paternity policies, lifelong learning (Assefa, 2023), and accessibility* – in the "Policies" activity area*.*
"Training" increases awareness and competence and should include *sustainability training for staff and students* and the continuous monitoring *of sustainability courses, particularly climate education*. *Sustainability micro-certificates* certify the acquired competencies and complement the respective diplomas. The maintenance and development of **"Library Services and Databases,"** available to all, provide strong support.

Success requires effective **"Incentives"** like *sustainability science programs, sustainability scholarships (students, teachers, researchers), climate scholarships (students, teachers, researchers), and support for priority research groups*. The recent pandemic and infectious diseases in general highlight the importance of hygiene and environmentally friendly cleaning products, i.e., constantly emphasized **"Green Hygiene"** solutions.
Student action groups, organizing sustainability events and programs, and regular *news and reports all help to achieve* **"Community involvement**."

The energy trilemma prioritizes *"Affordable, clean, renewable energy and security of supply"* for the **"Prosperity WP" (SDGs 7-11).** An effective WP requires

the right **"Conditions,"** i.e., *proper working, education, and learning environments* and, in a broader sense, the harmony of the systemic elements of *urban ecology and innovation* (Wu, 2014).

The **"Finance"** domain must address *climate change and sustainability-related financial issues* and new financial challenges (e.g., environmental costs).

"University Well-being" and **"Expert databases"** activities affect the work package. *Fair trade* (Kim, 2023), *sustainable supply chains* (Meja-Manzano et al., 2023), and *ethical material sourcing* are among the sustainability priorities in the **'Procurement'** area, which impacts well-being. However, **"Food"** also addresses *sustainable food* (Pasquier Merino, 2022) or *community garden initiatives* (Baur, 2022).

"Activities in open/green spaces" help people understand the emotional and cultural aspects of humanity's relationship with nature, including *art, music, literature, gentle tourism* (Rinaldi et al., 2022), *basics of natural sciences, knowledge of edible plants*, and systematic elements of relevant *engineering analyses*.

"Morality" is the primary area of activity of **"Peace WP" (SDG 16)**. Here, systemic aspects of the *university freedom policy, human rights protection, anti-discrimination efforts, and sustainability policies (with SDG connections)* are implemented at the community level. The dominant motives at the **individual level** are *student responsibilities, leadership development,* and creating a *sustainability identity*.

"Performance evaluation" is crucial for system optimization and analyzing the achievement of the established goals. Ensuring *comparability* in this regard requires a *system for rating and evaluating sustainability*. *Competing in the global university sustainability rankings (Galleli et al., 2022) and winning awards (IGGA, 2022)* will be beneficial in this activity field*.*

This work package also aims to strengthen the university's **"Catalyst Role"** by developing *dissemination activities* related to sustainability, performance, best practices, and continuous improvement.

5 Conclusions

Sustainability has become a key concept in most areas of life, including science. Universities and their managements must consider environmental, social, and economic dimensions. The University of Sopron has acknowledged this and increasingly emphasizes implementing its sustainability strategy.

The coherent, systemic design, implementation, maintenance, and operation of the work packages, activity areas, and system elements presented in the University of Sopron's Sound of the Earth Implementation Program guarantee the continuous sustainability performance improvement.

The University of Sopron is highly committed to evaluating its sustainability performance and therefore participates on the sustainable world university rankings such as UI GreenMetric since 2020 and achieves better and better results every year. In 2023 we are ranked 130th (close to TOP10%) in the worldwide ranking list, 47th among the European universities, and 3rd among the Hungarian HEIs. The University of Sopron reached the 82% of the total score (8,200/10,000 scores) in 2023 that was ca. 180% rise up in four years, that is unique in Hungary. To keep the best positions the university' leadership invested sustainable infrastructural development, such as construction of a biomass heating plant, comprehensive development of waste management system, purchase selective bins and bikes. In our case the strongest indicator groups are the "Energy and Climate Change", "Water management",

"Transportation" and the "Education and Research", in these we have leading position among Hungarian Universities.

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