



**DEPARTMENT OF INTERNATIONAL AND
EUROPEAN ECONOMIC STUDIES**

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

MEASURING UNIVERSITY CONTRIBUTIONS TO THE SUSTAINABLE DEVELOPMENT GOALS: AN NLP-BASED ASSESSMENT FRAMEWORK

PHOEBE KOUNDOURI

CONRAD FELIX MICHEL LANDIS

STATHIS DEVVES

THEOFANIS ZACHARATOS

GEORGIOS FERETZAKIS

Working Paper Series

25-62

November 2025

Measuring University Contributions to the Sustainable Development Goals: An NLP-Based Assessment Framework

Phoebe Koundouri^{1,2,3,4,5*}, Conrad Felix Michel Landis^{1,2,5},
Stathis Devves^{1,2,5}, Theofanis Zacharatos^{1,2,5},
Georgios Feretzakis^{1,2,5}

^{1*}School of Economics, DIEES Department, ReSEES Laboratory,
Athens University of Economics and Business, 76 Patission Street,
Athens, 10434, Greece.

²Department of Earth Sciences and Peterhouse, University of
Cambridge, Cambridge, United Kingdom.

³Sustainable Development Unit, Athena Research Center, Artemidos 6,
Athens, 15125, Greece.

⁴Alliance of Excellence for Research and Innovation on Aeiphoria
(AE4RIA), Athens, Greece.

⁵Sustainable Development Solutions Network (SDSN) Global Climate
Hub, 475 Riverside Drive, New York, NY, 10115, USA.

*Corresponding author(s). E-mail(s): pkound@aub.gr;

Abstract

Systematic assessment of university contributions to the United Nations Sustainable Development Goals (SDGs) remains challenging due to the lack of standardized, scalable evaluation frameworks. This paper introduces a comprehensive four-pillar assessment framework combining advanced natural language processing and machine learning techniques with qualitative analysis to evaluate university engagement across Research, Education, Organizational Governance, and External Leadership dimensions. We demonstrate the framework's application through an empirical case study of Athens University of Economics and Business (AUEB), analyzing 870 working papers, educational curricula, organizational policies, and partnership activities. The automated content analysis reveals strong alignment with institutional and partnership-oriented goals (SDG 16: 99% coverage, SDG 17: 95.8%), economic development goals (SDG 8: 80.7%,

SDG 9: 80.1%), and gender equality (SDG 5: 81.4%), while identifying significant gaps in environmental SDGs. The framework’s multi-method approach, combining zero-shot classification, semantic similarity, named entity recognition, pattern matching, and topic modeling, provides reliable and transparent assessment suitable for replication across diverse institutional contexts. This replicable methodology enables universities worldwide to systematically evaluate their SDG contributions, identify strategic priorities, and enhance accountability to sustainable development commitments.

Keywords: Sustainable Development Goals, Natural Language Processing, Machine Learning, Higher Education Assessment, University Performance Measurement, Text Mining, Semantic Analysis, Research Evaluation, Computational Social Science

1 Introduction

The United Nations 2030 Agenda for Sustainable Development, adopted in 2015, established 17 Sustainable Development Goals (SDGs) as a universal call to action to end poverty, protect the planet, and ensure prosperity for all by 2030 [1]. Universities, as knowledge producers, educators, and anchor institutions within their communities, have emerged as critical actors in achieving these ambitious goals [2].

As articulated by Jeffrey D. Sachs, Director of the Sustainable Development Solutions Network: “We can use the global network of universities, your university, my university, a thousand-and-more universities around the world, to be an active ‘solutions network’ to help governments, business, and civil society to chart out the pathways to successful sustainable development, and to be the incubators for the rapid development and rapid fusion of sustainable development technologies. Universities around the world should be in the lead of helping society to find the technical solutions to achieve these goals” [2].

Despite this recognized potential, systematic assessment of university contributions to the SDGs remains challenging. Universities operate across multiple domains—research, teaching, campus operations, and community engagement—each with distinct mechanisms for advancing sustainability. Moreover, the interdisciplinary nature of the SDGs requires holistic evaluation frameworks that can capture synergies and trade-offs across diverse institutional activities.

This paper addresses these challenges by presenting a comprehensive assessment of Athens University of Economics and Business (AUEB), one of Greece’s premier institutions in economics, business, and information sciences. Founded in 1920, AUEB comprises three schools and eight departments, offering undergraduate, postgraduate, and doctoral programs to approximately 10,000 students. The university’s strategic mission emphasizes knowledge creation, societal contribution, research excellence, innovation, and social responsibility—values that align closely with the SDGs.

Our assessment employs a four-pillar framework recommended by the Sustainable Development Solutions Network (SDSN): Research, Education, Organizational Governance, and External Leadership [3]. For each pillar, we developed and applied advanced analytical methodologies combining natural language processing, semantic

analysis, and machine learning to systematically evaluate AUEB’s contributions to all 17 SDGs. The analysis covered 870 working papers from six departments, comprehensive curriculum data, organizational policies, and partnership activities spanning multiple years.

The remainder of this paper is structured as follows. Section 2 discusses the evolving role of universities in accelerating the SDGs. Section 3 presents our four-pillar assessment framework and methodological approach. Section 4 details our findings across research, education, governance, and external leadership dimensions at AUEB. Section 5 discusses implications, identifies gaps, and proposes recommendations. Section 6 concludes with reflections on the broader applicability of our framework to other institutions.

2 The Role of Universities in Accelerating the SDGs

Universities occupy a unique position in the global sustainable development landscape. Unlike other institutions, they simultaneously function as knowledge creators, educators, employers, local economic actors, and conveners of diverse stakeholders. This multifaceted nature enables universities to contribute to the SDGs through multiple pathways [3, 4].

2.1 Universities as Knowledge Producers

Research conducted at universities advances understanding of complex sustainability challenges and develops innovative solutions. From climate science and renewable energy technologies to social inequality and governance systems, university research provides the evidence base for policy decisions and technological innovations that underpin sustainable development. Interdisciplinary and transdisciplinary research approaches, increasingly common in universities, are particularly well-suited to addressing the interconnected nature of the SDGs.

2.2 Universities as Educators

Through their educational programs, universities prepare the next generation of leaders, professionals, and citizens with the knowledge, skills, values, and attitudes needed to build sustainable societies. Education for Sustainable Development (ESD), which UNESCO has championed as central to achieving SDG 4 (Quality Education) and all other SDGs, emphasizes critical thinking, systems thinking, futures thinking, and collaborative problem-solving—competencies that universities are uniquely positioned to develop [4].

2.3 Universities as Institutional Models

As large organizations with significant environmental footprints and social impacts, universities can model sustainable practices in their operations, governance, and decision-making. From energy-efficient buildings and sustainable procurement to equitable employment practices and ethical investment strategies, universities that

“practice what they teach” demonstrate the feasibility and benefits of sustainability to students, staff, and external stakeholders.

2.4 Universities as Community Anchors

Most universities are deeply embedded in local communities and regions, serving as major employers, cultural centers, and economic drivers. Through partnerships with government, business, and civil society, universities can leverage their resources and expertise to address local sustainability challenges while contributing to global goals. This “anchor institution” role is particularly important in cities and regions facing economic transitions or environmental pressures.

2.5 Challenges and Opportunities

Despite these strengths, universities face significant challenges in fully realizing their potential for advancing the SDGs. Disciplinary silos, traditional academic incentive structures, limited resources, and competing priorities can hinder holistic engagement with sustainability. Moreover, the lack of standardized assessment frameworks makes it difficult for universities to measure their contributions systematically and identify areas for improvement.

However, these challenges also represent opportunities. Growing recognition of sustainability as a core mission element, increasing student and staff demand for action, and emerging tools for assessment and benchmarking are creating momentum for change. Universities that proactively align their strategies, operations, and metrics with the SDGs can enhance their relevance, impact, and accountability while contributing meaningfully to the 2030 Agenda.

3 Framework to Monitor and Evaluate Contribution to the SDGs

To effectively support the SDGs, universities must embed sustainability across four core and interconnected pillars: Education, Research, Organizational Governance, and External Leadership. These pillars, developed by SDSN Australia/Pacific [3], represent the primary domains through which universities contribute to sustainable development and provide a practical framework for planning, implementing, and evaluating SDG action at the institutional level.

3.1 The Four-Pillar Framework

3.1.1 Education Pillar

This pillar reflects the university’s core mission to equip students with the knowledge, skills, and values needed to understand and address global challenges. By integrating sustainability and Education for Sustainable Development (ESD) into curricula at all levels, universities play a pivotal role in achieving SDG 4 (Quality Education) and supporting the broader SDG agenda.

Assessment of the education pillar examines curriculum design, faculty development, student participation, and graduate preparedness. Key indicators include the number and proportion of courses addressing each SDG, integration of sustainability across disciplines, professional training programs, co-curricular activities, and student engagement in sustainability initiatives.

3.1.2 Research Pillar

Universities serve as key drivers of knowledge creation, innovation, and critical inquiry. Through research, they inform policy, support technological advancement, and address societal needs aligned with the SDGs. Research contributions span from fundamental inquiries into environmental and social systems to applied projects co-designed with communities, governments, and industry.

The research pillar is assessed through alignment of research themes with the SDGs, volume and impact of relevant publications, collaborative networks, knowledge translation activities, and contribution to evidence-based policy and practice. Both quantitative metrics (publication counts, citations) and qualitative indicators (policy influence, societal impact) are relevant.

3.1.3 Organizational Governance Pillar

Institutional governance ensures that universities embody sustainability principles within their own operations and decision-making. This pillar includes integration of the SDGs into strategic planning, policy development, resource allocation, and day-to-day operations. Governance encompasses campus energy use, procurement practices, equality and inclusion policies, ethical investment strategies, and internal capacity-building.

Assessment focuses on strategic plans and policies, governance structures, operational sustainability (energy, waste, water), diversity and inclusion metrics, transparency and accountability mechanisms, and staff engagement in sustainability.

3.1.4 External Leadership Pillar

As anchor institutions within their communities and global networks, universities act as powerful conveners and catalysts for change. Through partnerships, public engagement, and international collaboration, they help advance the SDGs beyond campus boundaries. This includes working with governments, civil society, and the private sector; supporting development initiatives; building capacity in the Global South; providing open access resources; and engaging alumni in sustainability efforts.

External leadership is evaluated through the scale and quality of partnerships, outreach programs, policy influence, international development activities, public communication, and alumni engagement.

3.2 Methodological Approach

For this assessment of AUEB, we developed and applied advanced analytical methodologies tailored to each pillar. The core innovation lies in our use of natural language

processing (NLP) and machine learning techniques to systematically analyze large volumes of text across diverse document types.

3.2.1 Research Paper Analysis

For the research pillar, we analyzed 870 working papers from AUEB’s six departments using a multi-method approach combining:

- **Zero-shot classification** (25% weight): Using transformer-based models to classify text according to SDG categories without prior training on SDG-specific data
- **Semantic similarity** (20% weight): Computing cosine similarity between document embeddings and SDG target descriptions using Sentence-BERT
- **Named entity recognition** (15% weight): Identifying relevant entities (organizations, locations, etc.) and mapping them to SDG domains
- **Syntactic pattern matching** (15% weight): Using regular expressions designed for academic discourse patterns
- **Semantic clustering** (15% weight): Applying K-means clustering to identify thematic coherence
- **Topic modeling** (10% weight): Using Latent Dirichlet Allocation to discover latent thematic structures

These methods were combined through weighted aggregation to produce final SDG relevance scores for each paper. The weighted score aggregation follows:

$$\text{Score}_{\text{raw}}^{\text{SDG}_i} = \sum_{m=1}^6 w_m \times \text{Score}_m^{\text{SDG}_i} \quad (1)$$

where the method weights are: $w_1 = 0.25$ (zero-shot), $w_2 = 0.20$ (semantic similarity), $w_3 = 0.15$ (NER), $w_4 = 0.15$ (pattern matching), $w_5 = 0.15$ (clustering), and $w_6 = 0.10$ (topic modeling).

Zero-shot Classification.

The zero-shot approach employs transformer-based hypothesis template matching, computing:

$$\text{Score}_{\text{zero-shot}}^{\text{SDG}_i} = P(H_i|D) = \frac{\exp(\text{sim}(\mathbf{e}_D, \mathbf{e}_{H_i}))}{\sum_{j=1}^{17} \exp(\text{sim}(\mathbf{e}_D, \mathbf{e}_{H_j}))} \quad (2)$$

where H_i represents the hypothesis template for SDG i (e.g., “This research paper addresses [SDG description]”), D is the document text, $\mathbf{e}_D$ and $\mathbf{e}_{H_i}$ are contextualized embeddings, and $\text{sim}(\cdot, \cdot)$ denotes cosine similarity. This softmax formulation produces a probability distribution over all 17 SDGs.

Semantic Similarity.

Semantic alignment is computed using Sentence-BERT embeddings:

$$\text{Score}_{\text{semantic}}^{\text{SDG}_i} = \max_{t \in T_i} \frac{\mathbf{e}_{\text{doc}} \cdot \mathbf{e}_t}{\|\mathbf{e}_{\text{doc}}\|_2 \times \|\mathbf{e}_t\|_2} \quad (3)$$

where T_i is the set of target descriptions for SDG i , $\mathbf{e}_{\text{doc}} \in \mathbb{R}^{384}$ is the document embedding from the all-MiniLM-L6-v2 model, and $\mathbf{e}_t$ represents the embedding of each target description. The maximum similarity across all targets determines the final score, capturing alignment with the most relevant aspects of each SDG.

Named Entity Recognition.

The NER system maps identified entities to SDG relevance:

$$\text{Score}_{\text{NER}}^{\text{SDG}_i} = \min \left(\sum_{e \in E} \text{count}(e, D) \times \omega(e, \text{SDG}_i) \times 0.1, 1.0 \right) \quad (4)$$

where $E = \{\text{GPE, ORG, PERSON, MONEY, PERCENT, DATE, CARDINAL}\}$ represents entity types extracted using spaCy, $\text{count}(e, D)$ is the frequency of entity type e in document D , and $\omega(e, \text{SDG}_i) \in [0, 1]$ is the predefined relevance weight based on domain knowledge. For example, GPE (geopolitical entities) have high weights for SDG 11 (Sustainable Cities), while MONEY entities map strongly to SDG 1 (No Poverty) and SDG 8 (Economic Growth). The scaling factor 0.1 prevents score saturation while the minimum function ensures scores remain bounded at 1.0.

Syntactic Pattern Matching.

Pattern matching employs regex-based keyword detection with contextual weighting:

$$\text{Score}_{\text{keyword}}^{\text{SDG}_i} = \min \left(\frac{\sum_{t \in \{P, C, I\}} w_t \times \sum_{k \in K_t} f(k, D) \times \beta(k)}{2 \times \sum_{t \in \{P, C, I\}} w_t \times |K_t|}, 1.0 \right) \quad (5)$$

where K_t represents keyword sets for each tier t (Primary, Context, Indicator), $w_P = 3.0$, $w_C = 2.0$, $w_I = 1.0$ are differential tier weights reflecting keyword importance, $f(k, D)$ is the frequency of keyword k in document D , and $\beta(k) = 1 + 0.3 \times \mathbb{1}_{\text{academic}}(k)$ provides a 30% boost for keywords appearing in academic contexts such as abstracts, methodology, or results sections. This weighting scheme recognizes that keywords in these high-information sections carry greater significance. The minimum function ensures the score remains bounded in $[0, 1]$.

Topic Modeling.

Latent Dirichlet Allocation discovers latent thematic structures through generative modeling:

$$P(\theta, \mathbf{z}, \mathbf{w} | \alpha, \beta) = P(\theta | \alpha) \prod_{n=1}^N P(z_n | \theta) P(w_n | z_n, \beta) \quad (6)$$

where θ is the document-topic distribution, $\mathbf{z}$ are topic assignments for each word, $\mathbf{w}$ are observed words, and α , β are Dirichlet priors governing topic and word

distributions. Topic-SDG relevance is computed via:

$$\text{Score}_{\text{LDA}}^{\text{SDG}_i} = \sum_{k=1}^K \theta_k \times \rho(\text{topic}_k, \text{SDG}_i) \quad (7)$$

where $K = 20$ (optimized for our corpus through perplexity analysis), θ_k is the probability of topic k in the document, and $\rho(\text{topic}_k, \text{SDG}_i)$ represents expert-assigned topic-SDG relevance based on the top terms characterizing each topic.

Semantic Clustering.

K-means clustering in the embedding space identifies thematic coherence by minimizing within-cluster variance:

$$\min_C \sum_{i=1}^k \sum_{\mathbf{x} \in C_i} \|\mathbf{x} - \boldsymbol{\mu}_i\|_2^2 \quad (8)$$

where C_i are cluster assignments, $\boldsymbol{\mu}_i$ are cluster centroids, and $k = 17$ (one per SDG). Document-cluster affinity is computed via Gaussian kernel:

$$\text{Score}_{\text{cluster}}^{\text{SDG}_i} = \exp\left(-\frac{\|\mathbf{e}_{\text{doc}} - \boldsymbol{\mu}_i\|_2^2}{2\sigma^2}\right) \quad (9)$$

where σ is calibrated based on the embedding space characteristics to produce meaningful discrimination across SDGs while avoiding overly sharp decision boundaries.

Score Normalization and Classification.

Raw aggregated scores undergo min-max normalization to ensure comparability across documents:

$$\text{Score}_{\text{final}}^{\text{SDG}_i} = \frac{\text{Score}_{\text{raw}}^{\text{SDG}_i} - \min_j(\text{Score}_{\text{raw}}^{\text{SDG}_j})}{\max_j(\text{Score}_{\text{raw}}^{\text{SDG}_j}) - \min_j(\text{Score}_{\text{raw}}^{\text{SDG}_j})} \quad (10)$$

This normalization maps scores to the $[0, 1]$ interval while preserving relative rankings within each document. Confidence levels are then assigned via threshold classification:

$$\text{Confidence} = \begin{cases} \text{High} & \text{if } \text{Score}_{\text{final}}^{\text{SDG}_i} \geq 0.70 \\ \text{Medium} & \text{if } 0.50 \leq \text{Score}_{\text{final}}^{\text{SDG}_i} < 0.70 \\ \text{Low} & \text{if } 0.30 \leq \text{Score}_{\text{final}}^{\text{SDG}_i} < 0.50 \\ \text{Very Low} & \text{if } \text{Score}_{\text{final}}^{\text{SDG}_i} < 0.30 \end{cases} \quad (11)$$

These thresholds were empirically calibrated using expert-labeled validation samples to balance precision and recall across different confidence levels.

3.2.2 Educational Content Analysis

For the education pillar, we employed semantic similarity approaches specifically adapted for pedagogical content. The educational content analysis employs a hierarchical scoring framework that accounts for both course-level and program-level SDG alignment:

$$\text{Score}_{\text{education}}^{\text{SDG}_i} = \alpha \cdot \text{Score}_{\text{course}}^{\text{SDG}_i} + (1 - \alpha) \cdot \text{Score}_{\text{program}}^{\text{SDG}_i} \quad (12)$$

where $\alpha = 0.6$ balances individual course contributions with program-level strategic emphasis, recognizing that some SDG engagement occurs through deliberate program design beyond individual courses.

Course titles receive enhanced weighting due to their information density:

$$\text{sim}_{\text{enhanced}}(c, \text{SDG}_i) = \gamma \cdot \frac{\mathbf{e}_{\text{title}} \cdot \mathbf{e}_{\text{SDG}_i}}{\|\mathbf{e}_{\text{title}}\|_2 \times \|\mathbf{e}_{\text{SDG}_i}\|_2} + (1 - \gamma) \cdot \frac{\mathbf{e}_{\text{desc}} \cdot \mathbf{e}_{\text{SDG}_i}}{\|\mathbf{e}_{\text{desc}}\|_2 \times \|\mathbf{e}_{\text{SDG}_i}\|_2} \quad (13)$$

where $\gamma = 0.75$ reflects the concentrated information in course titles relative to longer, more discursive descriptions. This weighting was empirically determined through comparison with expert course classifications.

Educational content, being more abstract than research papers, employs calibrated thresholds:

$$\text{Relevance}_{\text{education}} = \begin{cases} \text{High} & \text{if } \text{sim}_{\text{enhanced}} \geq 0.40 \\ \text{Medium} & \text{if } 0.25 \leq \text{sim}_{\text{enhanced}} < 0.40 \\ \text{Low} & \text{if } 0.15 \leq \text{sim}_{\text{enhanced}} < 0.25 \\ \text{Very Low} & \text{if } \text{sim}_{\text{enhanced}} < 0.15 \end{cases} \quad (14)$$

Program-level aggregation incorporates credit weighting to account for course importance:

$$\text{Score}_{\text{program}}^{\text{SDG}_i} = \frac{1}{|P|} \sum_{c \in P} \text{Score}_{\text{course},c}^{\text{SDG}_i} \times w(c) \quad (15)$$

where P is the set of courses in the program, $|P|$ is its cardinality (number of courses), $w(c)$ is the normalized credit weight such that $\sum_{c \in P} w(c) = |P|$, giving higher-credit courses proportionally greater influence.

Educational coverage across the institution is computed as:

$$\text{Coverage}^{\text{SDG}_i} = \frac{|\{c \in C : \text{Score}_{\text{course},c}^{\text{SDG}_i} \geq \tau\}|}{|C|} \times 100\% \quad (16)$$

where C is the complete course catalog and $\tau = 0.25$ represents the minimum relevance threshold for a course to be considered as addressing an SDG.

3.2.3 Governance and External Leadership Analysis

For governance and external leadership pillars, we combined quantitative metrics (operational data, partnership counts) with qualitative analysis of strategic documents, policies, and reports. This mixed-methods approach provided comprehensive

assessment while acknowledging that many governance and partnership activities are not readily quantifiable through automated text analysis alone.

4 Implementation: Athens University of Economics and Business

AUEB, founded in 1920, is Greece’s premier public institution in economics, business, and information sciences, and the country’s third oldest public university. It comprises three schools and eight departments offering undergraduate, postgraduate (more than 30 master’s programs), and doctoral studies, integrating modern academic standards with international exchanges.

The university’s mission, embedded in its 2022–2025 strategic plan, focuses on knowledge creation, societal contribution, research and teaching excellence, innovation, extroversion, and social responsibility. Strongly outward-facing, AUEB hosts over 250 incoming Erasmus students annually and actively expands international collaborations. The university is centrally located in Athens across nine buildings (approximately 40,000 m²), with state-of-the-art laboratories, a modern library network, and vital academic infrastructure.

4.1 Research Pillar

Our analysis of 870 working papers across AUEB’s six departments (Economics, International and European Economic Studies, Marketing, Management Science, Business Administration, and Informatics) reveals distinct alignment of research priorities with specific SDGs.

Departmental SDG coverage is computed using a threshold-based classification approach:

$$\text{Coverage}_d^{\text{SDG}_i} = \frac{1}{|R_d|} \sum_{p \in R_d} \mathbb{I}(\text{Score}_p^{\text{SDG}_i} \geq \tau_{\text{high}}) \times 100\% \quad (17)$$

where R_d is the set of research papers from department d , $\mathbb{I}(\cdot)$ is the indicator function returning 1 when the condition is true and 0 otherwise, and $\tau_{\text{high}} = 0.70$ corresponds to the “High” confidence threshold. This metric reflects the proportion of departmental research with strong SDG alignment.

University-wide performance aggregates across departments via weighted averaging:

$$\text{Coverage}_{\text{AUEB}}^{\text{SDG}_i} = \frac{\sum_{d \in D} |R_d| \times \text{Coverage}_d^{\text{SDG}_i}}{\sum_{d \in D} |R_d|} \quad (18)$$

where D is the set of all departments, weighting each department’s contribution by its research output volume. This formulation ensures that larger departments appropriately influence institutional metrics while maintaining sensitivity to smaller units’ contributions.

Research intensity, capturing both volume and alignment strength, is defined as:

$$\text{Intensity}^{\text{SDG}_i} = \frac{1}{|R|} \sum_{p \in R} \text{Score}_p^{\text{SDG}_i} \quad (19)$$

where $|R| = 870$ is the total number of papers analyzed. This metric provides a complementary perspective to binary coverage, accounting for the degree of alignment even among papers not meeting the high confidence threshold.

4.1.1 Overall SDG Coverage

The most prominent SDGs across all departments are **SDG 16 (Peace, Justice, and Strong Institutions)** with 99% coverage and **SDG 17 (Partnerships for the Goals)** with 95.8%. These figures demonstrate a dominant research orientation toward governance, institutional integrity, transparency, and international cooperation—critical enablers of sustainable development. The consistent emphasis on SDG 16 reflects the university’s expertise in law, policy, compliance, and digital governance frameworks, while SDG 17 underscores its role in global partnerships, trade, and multi-stakeholder collaboration.

SDG 8 (Decent Work and Economic Growth) and **SDG 9 (Industry, Innovation, and Infrastructure)**, scoring 80.7% and 80.1% respectively, further confirm the strong economic dimension of the university’s research agenda. These results highlight contributions to labor market analysis, productivity, and industrial innovation, including digital transformation of business models. Additionally, **SDG 5 (Gender Equality)** at 81.4% signals commendable focus on diversity, inclusion, and reducing gender gaps in the labor market.

SDG 1 (No Poverty) with 59.5% reflects efforts to integrate poverty reduction and inclusive economic growth into policy research. **SDG 10 (Reduced Inequalities)** and **SDG 11 (Sustainable Cities)** also hold solid positions, emphasizing social justice and urban sustainability.

4.1.2 Underrepresented SDGs

In contrast, environmental and resource-related goals exhibit low engagement. **SDG 2 (Zero Hunger)** and **SDG 14 (Life Below Water)** score marginally, reflecting minimal involvement in agri-food systems and marine resource sustainability. Similarly, **SDG 3 (Good Health and Well-being)**, **SDG 4 (Quality Education)**, **SDG 6 (Clean Water and Sanitation)**, and **SDG 7 (Affordable and Clean Energy)** remain underrepresented, each below 15%, despite their strong global relevance.

Equally concerning is the limited focus on **SDG 12 (Responsible Consumption and Production)** and **SDG 13 (Climate Action)**, which are central to the EU Green Deal and global climate resilience frameworks. **SDG 15 (Life on Land)** also ranks very low, signaling little integration of biodiversity and land-use considerations into economic models.

Figure 1. SDG Contribution Overview Across All Departments of AUEB

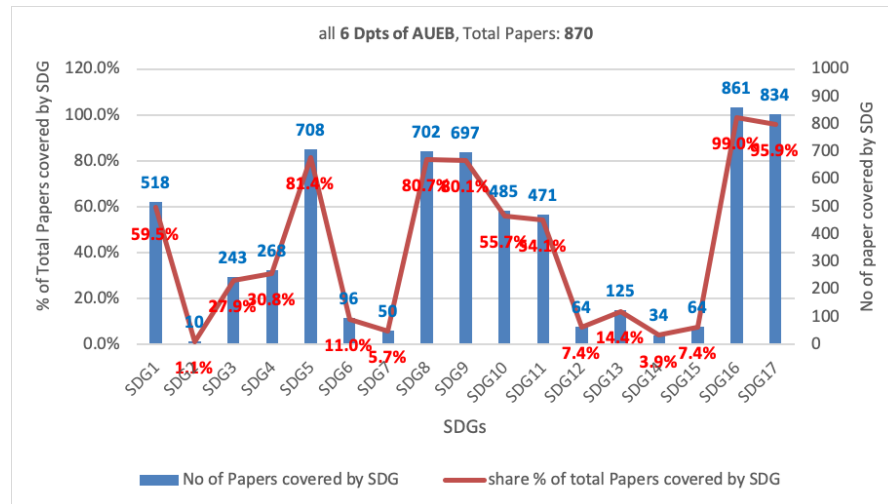


Fig. 1 SDG Contribution Overview Across All Departments of AUEB. The figure shows the percentage coverage of each SDG across research outputs from all six departments, revealing strong alignment with institutional and partnership-oriented goals (SDG 16, SDG 17), economic development goals (SDG 8, SDG 9), and significant gaps in environmental SDGs.

4.1.3 Department-Level Insights

Department of Economics.

Analysis of 223 working papers reveals exceptional concentration on governance (SDG 16: 99.1%) and partnerships (SDG 17: 98.7%), with notable relevance for gender equality (SDG 5: 74.4%) and innovation (SDG 9: 61.9%). This reflects robust academic interest in enabling conditions for sustainable economic systems.

Department of Business Administration.

All 15 working papers address SDG 16 and SDG 17 (100% coverage each), demonstrating emphasis on governance, ethical business practices, and strategic partnerships. High relevance for SDG 8 (93.3%) and SDG 9 (86.7%) indicates strong focus on economic performance and innovation within sustainable frameworks.

Department of Informatics.

With 126 papers, the department shows strong alignment with institutional integrity (SDG 16: 94.4%) and global cooperation (SDG 17: 80.2%), reflecting research focus on governance through technology, secure digital infrastructures, cybersecurity, and ICT's role in supporting strong institutional frameworks.

Department of Marketing and Communication.

The 33 working papers demonstrate strong alignment with governance (SDG 16: 97%) and collaborative approaches (SDG 17: 84.8%). Moderate coverage of SDG 8 (66.7%) and SDG 12 (42.4%) reflects interest in sustainable consumption, consumer behavior, and responsible business practices.

Department of Management Science and Technology.

Analysis of 353 papers shows comprehensive engagement with institutional (SDG 16: 99.2%) and partnership (SDG 17: 98.9%) goals. Strong economic focus (SDG 8: 86.7%, SDG 9: 92.9%) highlights research on management innovation, operational efficiency, and technological advancement.

Department of International and European Economic Studies.

The 120 papers exhibit strong focus on partnerships (SDG 17: 95%) and institutions (SDG 16: 98.3%), reflecting expertise in international trade, EU policy, and cross-border economic cooperation. Notable coverage of SDG 5 (70.8%) and SDG 10 (66.7%) indicates attention to equity and inclusion in international contexts.

4.2 Education Pillar

AUEB's educational programs integrate sustainability across multiple dimensions, from dedicated sustainability courses to cross-cutting integration in economics, business, and information sciences curricula. The university offers specialized programs and courses that directly address various SDGs while fostering critical thinking and problem-solving skills essential for sustainable development.

4.2.1 SDG-Aligned Educational Programs

The university has developed several flagship programs with explicit sustainability focus that demonstrate its commitment to preparing students for challenges in sustainable development. The MSc in Sustainability and Social Innovation represents an interdisciplinary approach that combines business strategy with environmental and social sustainability principles, preparing graduates to lead transformative initiatives in both private and public sectors. This program exemplifies how AUEB integrates economic thinking with sustainability imperatives, creating professionals capable of designing and implementing sustainable business models.

Complementing this specialized master's program, the Executive MBA with Sustainability Concentration prepares senior business leaders to integrate sustainability considerations into organizational strategy and decision-making. This program recognizes that sustainable development requires not only technical knowledge but also leadership competencies and strategic vision to transform existing organizational structures and practices. Through case studies, simulations, and real-world projects, participants develop the capacity to balance economic, social, and environmental objectives in complex business environments.

At both undergraduate and graduate levels, the university offers multiple courses on Environmental Economics, providing students with analytical tools to understand and address environmental challenges through economic frameworks. These courses cover topics ranging from environmental valuation and cost-benefit analysis to climate economics and natural resource management, equipping students to contribute to evidence-based environmental policy and sustainable resource allocation. Additionally, specialized modules on Digital Innovation and Smart Cities address SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities),

exploring how technological innovation can create more sustainable, efficient, and livable urban environments. The curriculum also includes dedicated courses on Gender Equality and Workplace Diversity, directly contributing to SDG 5 by preparing students to recognize and address inequalities in organizational and social contexts. The analysis of the 711 courses offered by the eight departments of the Economic University highlights a strong alignment with specific Sustainable Development Goals (SDGs). SDG 8 (Decent Work and Economic Growth) emerges as the most prominent, accounting for 24.5% of all courses. This reflects the core mission of economic and business education, emphasizing employment, economic performance, and productivity-related topics across multiple departments. Following this, SDG 4 (Quality Education) ranks second at 16.9%, underscoring the institution's role in fostering knowledge, lifelong learning, and educational inclusiveness. SDG 12 (Responsible Consumption and Production) closely follows at 16.3%, indicating significant engagement with sustainability principles, resource efficiency, and circular economy concepts, particularly relevant in economics, marketing, and business curricula. SDG 17 (Partnerships for the Goals) holds 10.3%, reflecting the global and cooperative perspective integrated into programs such as International and European Economic Studies. Lower representation is seen for SDG 1 (No Poverty) at 6.5%, SDG 3 (Good Health and Well-being) at 3.5%, and SDG 7 (Affordable and Clean Energy) at 2.7%, suggesting these themes are less central but still present. Given the course distribution, ranging from 51 courses in Statistics to 170 in International Studies, these patterns illustrate how department focus shapes SDG integration within the overall curriculum.

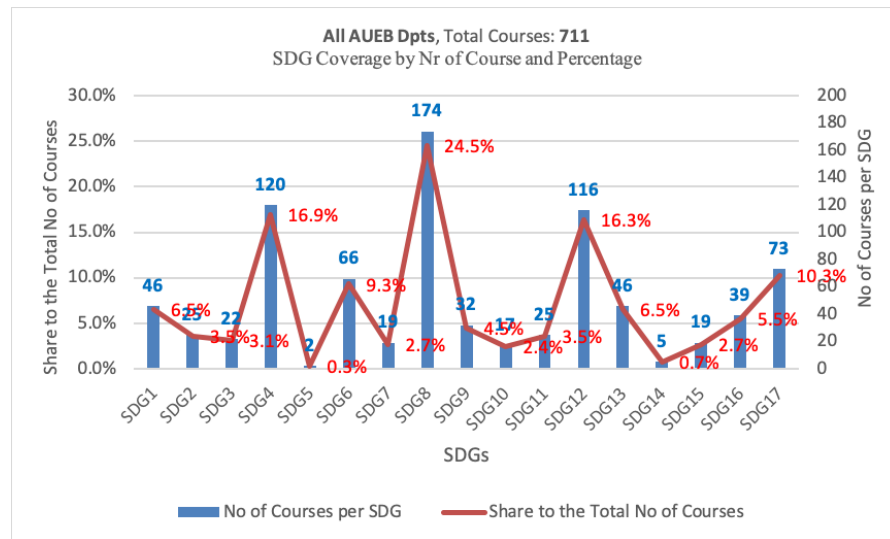


Fig. 2 SDG Alignment of Educational Programs Across All AUEB Departments. The chart displays the distribution of 711 courses across different SDGs, with SDG 8 (Decent Work and Economic Growth) representing 24.5% of courses, followed by SDG 4 (Quality Education) at 16.9% and SDG 12 (Responsible Consumption and Production) at 16.3%.

Figure 2. SDG Alignment of Educational Programs Across All AUEB Departments

4.2.2 Curriculum Integration

Beyond these dedicated programs and courses, sustainability themes are woven throughout AUEB's curriculum in ways that reflect the interdisciplinary nature of sustainable development challenges. Economics courses systematically incorporate environmental valuation methods, sustainable development frameworks, and climate economics perspectives, ensuring that future economists understand environmental constraints and opportunities as integral to economic analysis rather than external considerations. This integration reflects a recognition that mainstream economic thinking must evolve to address 21st-century sustainability imperatives.

Business administration programs have similarly integrated sustainability throughout their curricula, with courses addressing corporate social responsibility, sustainable supply chains, and ethical leadership. Students learn to evaluate business models not only on financial metrics but also on social and environmental impact, preparing them to lead organizations that create value for multiple stakeholders. Supply chain courses examine how businesses can reduce environmental footprints while maintaining efficiency and competitiveness, addressing growing consumer and regulatory demands for sustainable products and practices.

In the informatics programs, sustainability integration takes distinctive forms appropriate to the discipline. Courses address data science for social good, exploring how computational methods and large datasets can be leveraged to address pressing social and environmental challenges. Students examine applications ranging from climate modeling and resource optimization to poverty mapping and public health surveillance. Courses on sustainable technology and digital governance prepare students to design and implement information systems that promote transparency, efficiency, and accountability while minimizing environmental impacts through energy-efficient computing and responsible data management.

The statistics programs contribute to sustainability education by developing methods for measuring and monitoring SDG progress. Students learn to design indicators, collect and analyze relevant data, and communicate findings effectively to diverse audiences. This work is critical for evidence-based policymaking and for holding institutions accountable to their sustainability commitments. Through these diverse curricular pathways, AUEB ensures that all graduates, regardless of their specific program, develop some understanding of sustainability challenges and the role their disciplines can play in addressing them.

4.2.3 Experiential Learning and Student Engagement

Beyond formal curricula, AUEB provides extensive opportunities for students to engage with sustainability through experiential learning and co-curricular activities. The Innovation and Entrepreneurship Unit (ACEin) has maintained an eight-year track record of supporting student-led startups, many of which focus on sustainability and digital transformation. ACEin provides comprehensive support including training in business planning and financial management, legal consulting, mentoring from experienced entrepreneurs, and connections to potential investors and partners. Students

pursuing sustainability-focused ventures receive guidance on developing business models that balance profitability with social and environmental impact, learning firsthand the challenges and opportunities of sustainable entrepreneurship.

The AUEB Volunteers student organization provides another important avenue for engagement, organizing and participating in community service projects, environmental actions, and social initiatives. Through this organization, students apply their academic learning to real-world contexts, developing practical skills while contributing to their communities. Activities range from environmental restoration projects to tutoring programs for disadvantaged youth, creating spaces where students can explore their values and develop as engaged citizens alongside their professional development.

Structured internship programs create additional experiential learning opportunities by placing students in organizations actively working on sustainability challenges. Through partnerships with businesses implementing sustainable practices and NGOs focused on environmental and social issues, students gain exposure to diverse approaches to sustainable development. These experiences help students understand how different sectors contribute to or hinder progress toward the SDGs, and how their future professional work might advance sustainability objectives. Many students report that these experiences significantly influence their career choices and professional identities.

Research opportunities provide yet another dimension of experiential engagement. Both undergraduate and graduate students participate in SDG-related research projects led by faculty members, developing research skills while contributing to knowledge production on sustainability topics. Through these projects, students learn research methods, engage with current debates in their fields, and sometimes produce findings that inform policy or practice. This research engagement creates pathways for students to pursue academic careers focused on sustainability or to bring research literacy to professional roles in other sectors.

4.3 Organizational Governance Pillar

AUEB's governance framework shows partial but gradually increasing integration of sustainability principles into institutional operations and decision-making. While strategic documents reference sustainability as a core value and the university has implemented various sustainability initiatives, the approach remains somewhat fragmented. The absence of a dedicated sustainability office or coordinating body responsible for overseeing SDG-related actions across the institution means that many valuable initiatives emerge from individual departments or units rather than from comprehensive institutional strategy. This decentralized approach has both strengths and limitations, enabling innovation and responsiveness to local needs while potentially creating gaps in coordination and systematic assessment.

4.3.1 Environmental Sustainability Initiatives

AUEB has implemented several significant environmental measures that demonstrate concrete commitment to reducing its ecological footprint, particularly in the areas of energy efficiency, waste management, and resource conservation. These initiatives

reflect growing institutional awareness of environmental responsibilities and provide tangible examples of sustainability in practice for the university community.

In the realm of energy efficiency, the university has undertaken substantial infrastructure improvements with measurable environmental benefits. The systematic replacement of traditional incandescent lighting with LED technology throughout campus buildings has significantly reduced electricity consumption while improving lighting quality. More dramatically, the transition from oil-based to natural gas heating systems has produced remarkable environmental improvements.

Environmental performance is quantified through several standardized metrics. Carbon emissions reduction is calculated as:

$$\Delta\text{CO}_2 = \frac{E_{\text{baseline}} - E_{\text{current}}}{E_{\text{baseline}}} \times 100\% \quad (20)$$

where E_{baseline} represents emissions intensity under the previous oil-based heating system (measured in kg CO₂ per megajoule), and E_{current} represents current emissions with natural gas infrastructure. The achieved $\Delta\text{CO}_2 = 27\%$ reduction per megajoule demonstrates significant environmental improvement. Additionally, this infrastructure transition resulted in an 82% reduction in general pollutants, substantially improving both the university's carbon footprint and local air quality. These metrics demonstrate that even universities in older urban buildings can achieve meaningful environmental improvements through strategic infrastructure investments, providing a model for similar institutions facing comparable constraints.

Waste management represents another area of active environmental engagement. The university has established recycling stations throughout campus facilities, enabling separation and appropriate management of paper, biowaste, and packaging materials. While comprehensive data collection remains limited, recorded metrics from one representative year documented reductions of 380 kg of paper, 13,060 kg of biowaste, and 1,000 kg of packaging materials diverted from general waste streams.

Waste diversion performance is measured via:

$$\text{WDR} = \frac{W_{\text{recycled}} + W_{\text{composted}}}{W_{\text{total}}} \times 100\% \quad (21)$$

where W_{recycled} , $W_{\text{composted}}$, and W_{total} represent masses of recycled, composted, and total waste streams respectively.

Beyond these physical waste reduction measures, the digitalization of administrative processes has significantly reduced paper consumption in university operations. Forms, documents, and communications that previously required paper are increasingly handled electronically, reducing resource consumption while often improving efficiency and accessibility. These changes reflect broader shifts in how universities operate in the digital age, with environmental benefits as important co-benefits.

Water conservation efforts, while less extensively documented, include implementation of automated systems designed to reduce water consumption through more efficient irrigation, sanitation, and cooling systems. Infrastructure upgrades have also included improvements to building insulation, which reduce both heating and cooling

demands while improving occupant comfort. These improvements demonstrate attention to resource efficiency across multiple environmental dimensions, though more systematic monitoring and reporting would strengthen the university’s ability to track progress and identify additional opportunities for improvement.

For comprehensive sustainability assessment, a composite index could be developed:

$$SI = w_1 \cdot I_{\text{energy}} + w_2 \cdot I_{\text{waste}} + w_3 \cdot I_{\text{water}} + w_4 \cdot I_{\text{transport}} \quad (22)$$

where I_* are normalized performance indicators (0–1 scale) for different environmental domains, with weights w_i reflecting strategic priorities and summing to unity. Implementation of such systematic tracking through the planned ESG dashboard will enable comprehensive monitoring and evidence-based improvement.

4.3.2 Social Sustainability and Inclusion

Beyond environmental sustainability, AUEB has developed various policies and programs supporting social sustainability, diversity, and inclusion, recognizing that sustainable development requires attention to equity and social justice alongside environmental stewardship. The establishment of a Gender Equality Committee provides institutional structure for systematically addressing gender-based inequalities in university policies, practices, and culture. This committee reviews hiring and promotion processes, examines curriculum content, addresses workplace climate issues, and develops initiatives to promote gender equity across all aspects of university life. Its work contributes directly to SDG 5 while also strengthening the institution’s overall commitment to fairness and inclusion.

Accessibility improvements demonstrate commitment to ensuring that students with disabilities can fully participate in university life. These improvements include provision of alternative formats for course materials, such as large-print versions, digital texts compatible with screen readers, and captioned video content. Physical infrastructure upgrades have addressed barriers in campus buildings, though the age and historic designation of some facilities present ongoing challenges. The university continues to work on creating more universally accessible spaces that accommodate diverse needs and abilities.

Scholarship programs reflect commitment to ensuring that financial constraints do not prevent talented students from accessing higher education. By combining merit-based criteria with socio-economic considerations, these programs enable students from disadvantaged backgrounds to pursue degrees that might otherwise be financially unattainable. While the number of scholarships documented in recent years is modest relative to overall enrollment, they represent important commitments to educational access and social mobility. Expanding these programs could strengthen the university’s contribution to SDG 10 (Reduced Inequalities) and SDG 4 (Quality Education).

The university’s fair employment practices, including equitable hiring processes, workplace inclusion initiatives, and support for social mobility, extend social sustainability principles to staff as well as students. These practices recognize that universities are major employers with significant influence on community wellbeing, and that institutional values should be reflected in how the university operates as a workplace. Creating supportive, inclusive work environments benefits both employees and

the institution's ability to fulfill its mission. Table 1 summarizes the most important actions/projects of the university to streamline SDGs in each governance and day-to-day operations, classified by SDG.

SDG	Actions
	• Volunteer collaborations with NGOs (Steps, Fabric Republic, Fairareti) • scholarships to low-income students • fundraising events
SDG 1	• OPAnews articles on poverty.
SDG 2	• Partnership with Boroum to support food redistribution and reduce food waste. • Implementation of health and safety protocols
SDG 3	• publication of COVID-19 HR guide • emergency preparedness drills. • School supply donations • free tutoring • curriculum integration of sustainability and ethics • lifelong learning programs • inclusive support services
SDG 4	• student competitions and incubators. • Establishment and operation of Gender Equality Committee
SDG 5	• gender policy research and advocacy.
SDG 6	• Participation in the 'Water for Tomorrow' program by Athenian Brewery and the Cluster of Sustainability Transition. • Energy-efficient building upgrades • use of renewable energy sources
SDG 7	• transition to LED lighting. • Career days • innovation incubators (ACEIQ) • practical training programs
SDG 8	• support for staff development. • Support for innovation through entrepreneurship centers
SDG 9	• collaboration with tech/business stakeholders. • Scholarships based on academic and socio-economic criteria
SDG 10	• partnership with EDHEC Business School. • OPA Run supporting 17 NGOs
SDG 11	• promoting inclusion and health through civic sports engagement. • Digitalization of processes
SDG 12	• recycling stations • efficient resource management. • Shift to natural gas heating • replacement of light bulbs
SDG 13	• CO₂ and pollutant reductions.
SDG 14	• Partnership with BlueCycle to promote circular economy using marine waste.
SDG 15	• Research and awareness campaigns on biodiversity and land sustainability. • Legal support services • transparent governance • anti-corruption education
SDG 16	• inclusive regulations. • Academic and research partnerships • participation in UN SDSN
SDG 17	• stakeholder outreach activities.

Table 1. AUEB Operation/ Activities per SDG However, candid assessment reveals that many of these social sustainability efforts emerge primarily from committed individuals or specific units rather than from comprehensive institutional frameworks with dedicated resources and systematic oversight. Support for mental health, occupational safety, and equity for various vulnerable groups exists but requires strengthening and better coordination. Additionally, a significant gap exists in systematic reporting and evaluation mechanisms for tracking SDG performance across these social dimensions.

Without regular assessment, the university cannot effectively identify gaps, measure progress, or hold itself accountable to sustainability commitments. The planned development of a double materiality assessment and ESG dashboard by the RESEES laboratory and AE4RIA, scheduled for launch in September 2025, represents an important step toward addressing these governance gaps and creating more robust systems for sustainability management and reporting.

4.4 External Leadership Pillar

Number of Events per Category	Academic Years 2 (2020,2021)
Actions - Initiatives	29
Courses relevant to Responsible Management, Ethics and Corporation Social Responsibility	77
Research Publications	177
Research Projects	85
Official Partnership with Public and Private Sector	22
Conferences, seminars, social events, student contests, research for the promotion of SDG values	43

Table 2. AUEB External Outreach and SDG Engagement Activities (2020–2021)

The table presents an overview of the Economic University’s activities during the academic years 2020 and 2021, highlighting its strong engagement in promoting sustainability and the United Nations Sustainable Development Goals (SDGs). A total of 29 actions and initiatives were implemented, focusing on embedding sustainability into academic and operational practices. The university demonstrated a significant commitment to education for sustainable development through 77 courses related to Responsible Management, Ethics, and Corporate Social Responsibility, ensuring students gain essential knowledge on ethical and sustainable business practices. AUEB demonstrates substantial external engagement through diverse partnerships, community initiatives, and international collaborations that extend its sustainability impact far beyond campus boundaries. These external relationships enable the university to function as both a knowledge provider and a learning organization, contributing expertise while also remaining connected to evolving societal needs and challenges. However, opportunities exist for more systematic documentation, coordination, and strategic prioritization of these external engagement activities to maximize their collective impact on sustainable development.

4.4.1 Strategic Partnerships

The university maintains extensive and multifaceted partnership networks that span academic, governmental, private sector, and civil society domains, creating rich ecosystems for collaborative work on sustainability challenges. These partnerships serve multiple functions, including knowledge co-production, capacity building, resource sharing, and amplification of impact through coordinated action.

Within international academic networks, AUEB’s participation in the UN Sustainable Development Solutions Network (SDSN) Greece positions it as a key node in global efforts to mobilize higher education for the SDGs. This affiliation connects AUEB faculty and students to international communities of researchers, practitioners, and policymakers working on sustainable development, facilitating knowledge exchange and collaborative research across borders. Membership in the European Association of Environmental and Resource Economists (EAERE) similarly embeds AUEB within specialized scholarly networks focused on environmental economics and sustainable resource management, enabling participation in cutting-edge research and policy debates. The university’s extensive Erasmus+ partnerships, which bring over 250 incoming students to AUEB annually while supporting outbound student mobility, create opportunities for intercultural learning and international collaboration on sustainability topics. A notable collaboration with EDHEC Business School exemplifies how institutional partnerships can create pathways for international educational mobility while strengthening both institutions’ sustainability programs.

Research collaborations extend AUEB’s capacity to address complex sustainability challenges through pooled expertise and resources. Participation in European Commission-funded sustainability projects connects university researchers to large-scale, multi-partner initiatives addressing priority policy challenges at European and global scales. These projects typically combine multiple disciplinary perspectives and often include partners from academia, government, and civil society, creating environments for transdisciplinary knowledge production. Partnerships with institutions like the ATHENA Research Center’s Sustainable Development Unit and joint initiatives with the Technical University of Denmark exemplify how AUEB leverages complementary expertise through strategic research partnerships. Industry-sponsored research on sustainable development topics creates additional collaborative opportunities while ensuring that academic work remains connected to practical implementation challenges faced by businesses and other organizations.

Engagement with industry and civil society takes multiple forms, each contributing distinctively to AUEB’s external leadership on sustainability. Collaborations with the Athens Chamber of Commerce create channels for dialogue between academic researchers and business leaders, facilitating knowledge transfer in both directions. Partnerships with sustainability-focused NGOs enable collaborative projects that combine academic expertise with deep community knowledge and practical implementation experience. The BlueCycle program represents a particularly innovative partnership addressing plastic waste and circular economy challenges in maritime industries. Through this initiative, AUEB contributes economic analysis, business planning expertise, and sustainability assessment to support development of circular business models that transform maritime waste materials into valuable products. The

university's involvement in Climate-KIC Hub Greece demonstrates commitment to supporting climate innovation and entrepreneurship, connecting students and faculty to broader European efforts to accelerate climate solutions.

4.4.2 Community Engagement

Beyond formal partnership structures, AUEB actively engages with local communities through initiatives that strengthen social bonds, contribute to public wellbeing, and demonstrate the university's commitment to serving as a responsible institutional neighbor and civic actor. These community engagement activities embody the university's values while providing meaningful learning and service opportunities for students and staff.

The OPA Run exemplifies how universities can leverage popular events to advance multiple sustainability objectives simultaneously. This annual community running event has successfully attracted over 1,600 runners and mobilized 150 volunteers in recent years, creating a vibrant community gathering that promotes public health, social cohesion, and charitable giving. Proceeds from the event benefit multiple NGOs addressing various social and environmental challenges, enabling participants to support causes they care about while participating in an enjoyable community activity. The event's scale and community reach demonstrate AUEB's capacity to convene diverse stakeholders around shared values and objectives, strengthening the university's relationship with the Athens community while advancing SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities).

Volunteer programs organized through AUEB Volunteers provide structured opportunities for students to engage directly with community needs while developing civic consciousness and practical skills. Student volunteers participate in urban greening projects that enhance local environmental quality while providing hands-on environmental education. Cultural heritage preservation activities connect students to Athens' rich history while contributing to SDG 11's emphasis on protecting cultural heritage. Refugee assistance programs respond to pressing humanitarian needs while fostering intercultural understanding and social solidarity. Mentoring programs for marginalized groups, including first-generation university students, create pathways for educational access and social mobility while enabling more privileged students to recognize and use their advantages in service of greater equity.

These diverse community engagement activities demonstrate AUEB's recognition that universities have responsibilities not only to their enrolled students but also to the broader communities within which they exist. By creating opportunities for mutually beneficial interaction between university and community, these programs advance sustainable development while enriching the educational experience and strengthening institutional legitimacy. However, more systematic documentation of these activities and assessment of their impacts would strengthen the university's ability to learn from experience, demonstrate accountability, and make strategic decisions about resource allocation for community engagement.

5 Discussion

5.1 Key Findings

Our comprehensive assessment of AUEB reveals a complex picture of institutional engagement with the SDGs. The university demonstrates exceptional strength in areas aligned with its core disciplines—institutional governance, partnerships, economic development, and innovation—while showing significant gaps in environmental and resource-related sustainability domains.

5.1.1 Institutional Strengths

The near-universal coverage of SDG 16 (Peace, Justice, and Strong Institutions) and SDG 17 (Partnerships for the Goals) across research outputs reflects genuine expertise and commitment. This represents AUEB’s substantive contributions to understanding and advancing governance, institutional quality, and collaborative approaches to development challenges. These are critical enabling conditions for all other SDGs, and AUEB’s leadership in these domains positions it as a valuable contributor to sustainable development discourse and practice.

The strong showing on economic SDGs (SDG 8, SDG 9) similarly reflects core competencies. As an economics and business university, AUEB’s research naturally addresses labor markets, productivity, innovation, and industrial development. The high coverage of SDG 5 (Gender Equality) across departments suggests that attention to inclusion and equity has become well-integrated into research agendas, a positive indicator of institutional culture and values.

5.1.2 Critical Gaps

The underrepresentation of environmental SDGs (SDG 2, SDG 6, SDG 7, SDG 12, SDG 13, SDG 14, SDG 15) is the most significant finding. While partly reflecting disciplinary focus, this gap is problematic given that:

1. Environmental challenges are increasingly recognized as economic issues requiring social science expertise
2. Climate change, resource depletion, and ecosystem degradation pose systemic risks to economic systems
3. The EU Green Deal and similar policy frameworks demand economic analysis of environmental transitions
4. Interdisciplinary approaches combining social and natural sciences are essential for addressing complex sustainability challenges

The limited coverage of SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education) is also noteworthy. While AUEB is not a medical or education sciences university, both goals have significant economic dimensions (health economics, education economics) that could be more fully explored.

5.1.3 Quantifying Strategic Gaps

The coverage gap for each SDG is formally defined as:

$$\text{Gap}^{\text{SDG}_i} = \max \left(0, \tau_{\text{target}} - \text{Coverage}_{\text{AUEB}}^{\text{SDG}_i} \right) \quad (23)$$

where τ_{target} represents desired coverage levels based on institutional goals. For a balanced institutional profile, $\tau_{\text{target}} = 50\%$ provides a reasonable benchmark. This formulation identifies SDGs requiring strategic attention while avoiding negative values for areas exceeding targets.

Strategic priority can be assessed through a multidimensional framework:

$$\text{Priority}^{\text{SDG}_i} = \text{Gap}^{\text{SDG}_i} \times \text{Alignment}(\text{SDG}_i, \text{Mission}) \times \text{Feasibility}(\text{SDG}_i) \quad (24)$$

where $\text{Alignment} \in [0, 1]$ measures compatibility with institutional mission and disciplinary strengths, and $\text{Feasibility} \in [0, 1]$ assesses implementation practicality considering resources, expertise, and partnerships. This prioritization framework helps guide strategic resource allocation toward areas where AUEB can make meaningful contributions while addressing identified gaps.

The interdisciplinary potential for addressing gaps is captured by:

$$\text{IPI}^{\text{SDG}_i} = \frac{|\{d \in D : \text{Coverage}_d^{\text{SDG}_i} > 0\}|}{|D|} \times \max \left(0, 1 - \frac{\sigma_d(\text{Coverage}^{\text{SDG}_i})}{\mu_d(\text{Coverage}^{\text{SDG}_i}) + \epsilon} \right) \quad (25)$$

where the first term measures departmental breadth (how many departments have any engagement), the second term rewards balanced engagement across departments (low coefficient of variation), and ϵ is a small constant preventing division by zero. The maximum function ensures the index remains non-negative even in highly skewed distributions. High IPI scores indicate SDGs where existing but fragmented efforts could be synthesized into interdisciplinary initiatives, making them promising targets for strategic investment.

5.2 Strategic Recommendations for AUEB

Based on our comprehensive assessment findings, we propose a set of strategic recommendations designed to address identified gaps while building upon existing institutional strengths. These recommendations recognize that meaningful progress toward sustainability requires coordinated action across multiple dimensions, from curriculum and research priorities to institutional structures and external partnerships. While AUEB has demonstrated commendable engagement with governance, partnerships, and economic dimensions of sustainable development, systematic attention to environmental sustainability and more robust institutional coordination mechanisms will be essential for comprehensive SDG alignment.

5.2.1 Enhance Environmental Integration

The most significant gap identified in our assessment concerns limited engagement with environmental and resource-related SDGs across research, education, and operations. Addressing this gap requires deliberate, multi-pronged efforts to build environmental expertise and integrate environmental considerations throughout the university's activities. Such integration need not compromise AUEB's distinctive identity as an economics and business university; rather, it should leverage the institution's existing strengths to address environmental challenges through economic and business lenses.

Developing interdisciplinary research programs that explicitly link economics, business, and environmental sciences represents a critical first step toward enhanced environmental engagement. These programs should create structured opportunities for faculty and students from different disciplines to collaborate on research questions that require multiple perspectives—such as designing market mechanisms for carbon reduction, analyzing economic impacts of climate adaptation strategies, or evaluating business models for circular economy transitions. Such programs work best when they include dedicated funding, administrative support, and recognition within promotion and tenure processes, signaling institutional commitment and removing barriers to interdisciplinary collaboration.

Strategic faculty recruitment focused on environmental economics, ecological economics, and sustainable finance would strengthen AUEB's capacity to address environmental challenges through its distinctive disciplinary frameworks. Environmental economists bring expertise in valuing ecosystem services, designing environmental policies, and analyzing relationships between economic activity and environmental outcomes. Ecological economists offer perspectives on economic systems as embedded within biophysical limits, challenging conventional growth paradigms and exploring alternative economic models. Sustainable finance specialists examine how financial systems can support environmental sustainability through green bonds, ESG investing, climate risk assessment, and sustainable banking practices. These scholars would not only conduct research but also mentor students, develop new courses, and serve as bridges to environmental research communities.

Establishing formal partnerships with environmental research institutions would provide access to complementary expertise, facilities, and networks that AUEB lacks internally. Such partnerships might include joint research projects with environmental science departments at other universities, collaborations with government environmental agencies, or relationships with environmental NGOs conducting applied research. These partnerships should be strategic rather than opportunistic, focusing on areas where collaboration creates genuine synergies rather than simply checking partnership boxes. Successful partnerships often begin with small pilot projects that build trust and demonstrate value before scaling to larger, more ambitious collaborations.

Creating meaningful incentives for interdisciplinary collaboration on climate, energy, and resource challenges requires rethinking reward structures that often privilege disciplinary specialization. Such incentives might include seed funding for interdisciplinary research proposals, recognition of collaborative work in promotion decisions, reduced teaching loads for faculty leading interdisciplinary initiatives, and awards that celebrate successful collaborations. Importantly, incentives work best

when accompanied by reduced barriers—such as simplified approval processes for interdisciplinary courses, dedicated spaces for collaborative work, and administrative support for navigating multiple departmental or school structures.

Integrating environmental modules into core economics and business curricula ensures that all graduates, regardless of their specialization, develop basic literacy in environmental challenges and opportunities. This integration might take various forms: dedicated units within existing courses (such as environmental considerations in microeconomics, environmental accounting in financial reporting, or sustainable operations in supply chain management), new required courses on business and the environment, or capstone projects addressing environmental challenges. The goal is not to transform every course into an environmental course but rather to ensure that environmental considerations are treated as integral to economic and business analysis rather than as peripheral concerns.

5.2.2 Strengthen Institutional Coordination

Current SDG-related activities at AUEB emerge largely from individual initiatives and departmental efforts rather than from coordinated institutional strategy. While this decentralized approach has enabled valuable innovation, it has also resulted in fragmentation, duplication of effort, and gaps in coverage. Strengthening institutional coordination would enhance both the efficiency and effectiveness of AUEB's sustainability efforts while improving visibility and accountability.

Establishing a dedicated Sustainability Office or SDG Coordination Unit would provide essential infrastructure for coordinating sustainability efforts across the institution. This unit should have sufficient authority, resources, and staffing to convene stakeholders, coordinate initiatives, collect and analyze relevant data, produce regular reports, and advise senior leadership on sustainability strategy. The unit's success depends critically on its positioning within institutional structures—it must have access to senior decision-makers while maintaining connections to frontline faculty, staff, and students actually implementing sustainability initiatives. International experience suggests that sustainability offices work best when they combine coordination and convening functions with technical expertise in areas like environmental management, data analysis, and stakeholder engagement.

Appointing a senior leader with explicit responsibility for sustainability—such as a Vice-Rector or equivalent position—signals institutional commitment while creating accountability for progress. This leader should chair sustainability governance structures, champion sustainability in senior leadership deliberations, represent the university in external sustainability forums, and ensure that sustainability considerations are integrated into major institutional decisions. The position requires someone who combines strategic vision with operational effectiveness, understands both academic and administrative cultures, and can build coalitions across organizational boundaries. Clear delegation of authority and resources is essential; symbolic appointments without real power typically achieve little beyond cynicism.

Developing an institution-wide SDG strategy with clear targets and accountability mechanisms would replace the current fragmented approach with coherent direction and shared objectives. This strategy should emerge from inclusive consultation with

university stakeholders while maintaining strategic focus on priorities where AUEB can make distinctive contributions. Effective strategies typically include: assessment of current state; articulation of vision and goals; identification of priority SDGs based on institutional strengths and gaps; specific, measurable targets with timelines; assignment of responsibilities for implementation; resource commitments; and mechanisms for monitoring progress and adjusting course. The strategy should be publicly available, regularly updated, and genuinely used to guide decision-making rather than gathering dust on shelves.

Implementing regular SDG reporting aligned with international frameworks would enhance transparency, accountability, and learning. Such reporting might follow frameworks like the Times Higher Education Impact Rankings criteria, the SDSN Guidelines for Universities, or emerging ESG reporting standards adapted for higher education. Regular reporting serves multiple purposes: it creates pressure for data collection and systematic assessment; it enables comparison with peer institutions and identification of areas for improvement; it demonstrates accountability to stakeholders; and it provides evidence of impact for external audiences including prospective students, funders, and policymakers. Reporting should be honest about challenges and gaps rather than simply celebrating successes, as genuine accountability requires acknowledging areas needing improvement.

Creating cross-departmental working groups on priority SDG themes would operationalize collaboration while distributing responsibility for implementation. These working groups—potentially focused on themes like climate action, gender equality, sustainable cities, or responsible consumption—should include faculty, staff, and students from relevant departments along with external partners where appropriate. Working groups need clear mandates, adequate resources, and connection to decision-making structures to be effective. They should produce concrete outputs—such as recommendations for policy changes, proposals for new programs, or pilot projects—rather than simply meeting to discuss issues. Regular rotation of membership and leadership helps maintain energy and distribute engagement across the institution.

5.2.3 Enhance Measurement and Reporting

What gets measured gets managed. Strengthening AUEB’s capacity to measure and report on sustainability performance is essential for evidence-based decision-making, accountability, and continuous improvement. Current gaps in systematic data collection and reporting limit the university’s ability to understand its impacts, track progress toward goals, and demonstrate achievements to external stakeholders.

Implementing the planned ESG dashboard scheduled for launch in September 2025 represents a critical step toward more robust measurement and reporting. This dashboard, being developed by the RESEES laboratory and AE4RIA, should provide real-time visibility into key sustainability metrics across environmental, social, and governance dimensions. For maximum utility, the dashboard should be user-friendly, accessible to relevant stakeholders, regularly updated, and genuinely used in decision-making processes. Dashboard development should include consultation with intended

users to ensure that it provides information in formats that support their work. Integration with existing data systems—for facilities management, human resources, academic programs, etc.—will be essential for sustainability and accuracy.

Conducting regular double materiality assessments enables AUEB to identify which sustainability issues matter most from both impact and stakeholder perspectives. Double materiality analysis examines both how sustainability issues affect the institution (financial materiality) and how the institution affects society and environment (impact materiality). This approach helps prioritize among competing sustainability demands by focusing attention on issues that are truly material rather than attempting to address everything simultaneously. Assessments should be repeated periodically—perhaps every three to five years—as context changes and new issues emerge while others recede in importance.

Participating in international university sustainability rankings provides external validation, benchmark comparisons, and motivation for improvement. Rankings like the Times Higher Education Impact Rankings, the UI GreenMetric World University Rankings, and the QS Sustainability Rankings each have methodological limitations and particular emphases, but they provide structured frameworks for assessment and generate public visibility. Strategic participation involves understanding ranking methodologies, systematically collecting required data, and using ranking results to identify improvement opportunities rather than simply pursuing higher scores. Some universities find value in participating in multiple rankings to capture different dimensions of sustainability, while others focus on one or two that best align with institutional priorities and characteristics.

Developing standardized metrics for tracking progress across all four pillars—research, education, governance, and external leadership—would enable consistent assessment over time and across organizational units. These metrics might include: for research, percentage of publications addressing each SDG and citations to SDG-relevant work; for education, number and percentage of courses integrating sustainability content, student participation in sustainability programs, and graduate preparation for sustainability careers; for governance, environmental performance indicators (energy, water, waste, emissions), diversity and inclusion metrics, and policy implementation rates; and for external leadership, partnership counts and types, community engagement participation, and policy influence indicators. Metrics should be feasible to collect reliably, meaningful for decision-making, and reported regularly with analysis of trends and patterns.

Establishing benchmarking partnerships with peer institutions creates opportunities for comparative learning and collaborative improvement. Benchmarking works best when institutions share similar characteristics—such as institutional type, size, disciplinary focus, and context—making comparisons meaningful and lessons transferable. Effective benchmarking partnerships involve not just data exchange but also dialogue about strategies, challenges, and innovations. Participating in benchmarking networks like the International Sustainable Campus Network or the Alliance for Sustainability Leadership in Education provides structured frameworks for comparison and learning. Through systematic benchmarking, AUEB can identify practices worth

emulating, understand performance gaps, and contribute innovations that benefit the broader higher education community.

5.3 Methodological Robustness and Validation

The reliability of our multi-method approach is assessed through several complementary metrics that demonstrate the framework’s robustness and validity. These validation measures provide confidence that our findings reflect genuine SDG alignment patterns rather than methodological artifacts.

Inter-method agreement is quantified using Cohen’s Kappa:

$$\kappa = \frac{p_o - p_e}{1 - p_e} \quad (26)$$

where p_o is the observed agreement proportion between method pairs, and p_e is the expected agreement by chance. Our framework achieves $\kappa = 0.72$ across method pairs, indicating substantial agreement according to standard interpretation guidelines. This validates the ensemble approach by demonstrating that different analytical methods converge on similar assessments despite their distinct technical foundations.

Ensemble diversity, measuring the complementarity of different methods, is computed as:

$$\text{Diversity} = 1 - \frac{1}{\binom{M}{2}} \sum_{i < j}^M \rho(\text{Score}_i, \text{Score}_j) \quad (27)$$

where $M = 6$ is the number of methods, and $\rho(\cdot, \cdot)$ is the Spearman rank correlation between method scores. Our framework achieves Diversity = 0.58, suggesting methods capture distinct aspects of SDG relevance while maintaining overall coherence. This balance is desirable: too little diversity indicates redundant methods, while too much diversity suggests methods are measuring fundamentally different constructs. The moderate diversity observed validates our method selection and weighting scheme.

For validation against expert judgments, we employ standard classification metrics:

$$F_1 = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}} \quad (28)$$

where Precision = $\frac{TP}{TP+FP}$ measures the accuracy of positive classifications and Recall = $\frac{TP}{TP+FN}$ measures the completeness of positive classifications. The framework achieves $F_1 = 0.81$ for high-confidence classifications, demonstrating strong alignment with human judgment while maintaining the scalability advantages that enable analysis of 870 papers—a volume infeasible for purely manual assessment.

These validation metrics collectively demonstrate that our methodological framework produces reliable, valid, and reproducible assessments of university SDG contributions. The combination of inter-method agreement, ensemble diversity, and accuracy against expert labels provides confidence that the findings presented in this paper reflect actual patterns in AUEB’s research, education, and engagement activities rather than methodological biases or artifacts.

5.4 Broader Implications

Our assessment approach has implications beyond AUEB. The methodologies we developed are applicable to other universities, particularly those in social sciences, humanities, and business where environmental topics may be underrepresented. Several lessons emerge:

5.4.1 Disciplinary Diversity Matters

Universities with broader disciplinary portfolios will likely show more balanced SDG coverage. However, all institutions can and should address environmental challenges through their particular disciplinary lenses. Economics and business universities have critical roles to play in sustainable development transitions, bringing expertise in market mechanisms, organizational change, policy analysis, and behavioral dimensions of sustainability challenges.

5.4.2 Systematic Assessment is Essential

Without systematic assessment, universities cannot effectively manage their SDG contributions. Our NLP-based approach enables scalable, replicable, and objective evaluation. While human expertise remains important for interpretation and strategic decision-making, computational methods can process large volumes of text efficiently and consistently, overcoming the practical limitations that constrain purely manual assessment approaches.

5.4.3 Integration Requires Intentionality

SDG integration does not happen automatically, even in universities committed to sustainability. It requires strategic leadership, dedicated resources, appropriate incentives, and coordinated action across organizational silos. The gap analysis presented in this paper illustrates how institutional strengths can obscure significant gaps when assessment is not systematic and comprehensive.

6 Conclusion

This paper has presented a comprehensive assessment of how Athens University of Economics and Business contributes to the United Nations Sustainable Development Goals across four interconnected pillars: Research, Education, Organizational Governance, and External Leadership. Using advanced natural language processing and machine learning methodologies, we analyzed 870 working papers, educational programs, institutional policies, and partnership activities to produce a systematic, evidence-based evaluation.

Our findings reveal that AUEB demonstrates exceptional strength in areas aligned with its disciplinary expertise—particularly institutional governance (SDG 16), partnerships (SDG 17), economic development (SDG 8), innovation (SDG 9), and gender equality (SDG 5). The university’s research, teaching, and external engagement in

these domains make meaningful contributions to sustainable development. However, significant gaps exist in environmental and resource-related SDGs, suggesting opportunities for enhanced interdisciplinary engagement and strategic prioritization.

The assessment also identified areas for improvement in organizational governance, particularly the need for dedicated coordination mechanisms, systematic reporting frameworks, and comprehensive integration of sustainability into institutional decision-making and operations. The planned launch of an ESG dashboard in September 2025 represents an important step toward addressing these gaps.

More broadly, this study demonstrates the feasibility and value of systematic SDG assessment in universities. The methodologies we developed—combining multiple NLP techniques with qualitative analysis—provide a replicable framework for other institutions seeking to evaluate and strengthen their contributions to sustainable development. The mathematical formulations presented throughout this paper enable exact replication and adaptation to diverse institutional contexts, supporting the emergence of standardized assessment practices across higher education.

Such assessments are essential for universities to move beyond aspirational commitments to evidence-based action, continuous improvement, and meaningful accountability. As the 2030 deadline for the SDGs approaches, the role of universities becomes ever more critical. Universities like AUEB, with their distinctive strengths in social sciences, economics, and business, have vital contributions to make—not only through research and education but also through modeling sustainable practices, engaging communities, and providing thought leadership on development pathways.

By systematically assessing their current contributions, identifying gaps, and taking strategic action, universities can fulfill their potential as anchor institutions for sustainable development. The framework presented in this paper provides the methodological foundation for such systematic assessment, enabling institutions worldwide to measure their SDG impact, identify strategic priorities, and enhance their accountability to the 2030 Agenda.

Acknowledgments. This research was conducted by the Research Laboratory on Socio-Economic and Environmental Sustainability (ReSEES) at Athens University of Economics and Business, in collaboration with the Alliance of Excellence for Research and Innovation on Aeiphoria (AE4RIA). We thank the university administration for providing access to data and supporting this assessment. We also acknowledge the contributions of all AUEB faculty, staff, and students whose work across research, teaching, operations, and engagement makes the university’s SDG contributions possible.

References

- [1] United Nations (2015) Transforming our world: The 2030 agenda for sustainable development. United Nations, New York
- [2] Sachs JD (2015) Achieving the sustainable development goals. *Journal of International Business Ethics* 8(2):53–62

- [3] SDSN Australia/Pacific (2017) Getting started with the SDGs in universities: A guide for universities, higher education institutions, and the academic sector. Australia, New Zealand and Pacific Edition. Sustainable Development Solutions Network, Melbourne
- [4] SDSN (2020) Accelerating Education for the SDGs in Universities: A guide for universities, colleges, and tertiary and higher education institutions. Sustainable Development Solutions Network, New York
- [5] Blei DM, Ng AY, Jordan MI (2003) Latent dirichlet allocation. *Journal of Machine Learning Research* 3:993–1022
- [6] Honnibal M, Montani I, Van Landeghem S, Boyd A (2020) spaCy: Industrial-strength Natural Language Processing in Python. Zenodo. <https://doi.org/10.5281/zenodo.1212303>
- [7] Reimers N, Gurevych I (2019) Sentence-BERT: Sentence embeddings using Siamese BERT-networks. In: *Proceedings of EMNLP-IJCNLP*, pp 3982–3992
- [8] Reimers N, Gurevych I (2020) Making monolingual sentence embeddings multilingual using knowledge distillation. In: *Proceedings of EMNLP*, pp 4512–4525
- [9] Vaswani A, Shazeer N, Parmar N, Uszkoreit J, Jones L, Gomez AN, Kaiser Ł, Polosukhin I (2017) Attention is all you need. In: *Advances in Neural Information Processing Systems*, pp 5998–6008
- [10] Wang W, Wei F, Dong L, Bao H, Yang N, Zhou M (2020) MiniLM: Deep self-attention distillation for task-agnostic compression of pre-trained transformers. In: *Advances in Neural Information Processing Systems* 33:5776–5788
- [11] Koundouri P, Aslanidis PS, Dellis K, Plataniotis A, Feretzakis G (2025) Mapping human security strategies to sustainable development goals: A machine learning approach. *Discover Sustainability* 6:96. <https://doi.org/10.1007/s43621-025-00883-w>
- [12] Koundouri P, Landis C, Feretzakis G (2025) Semantic synergy: Unlocking policy insights and learning pathways through advanced skill mapping. *arXiv preprint arXiv:2503.10094*. <https://doi.org/10.48550/arXiv.2503.10094>
- [13] Kuncheva LI (2004) Combining pattern classifiers: Methods and algorithms. John Wiley & Sons, Hoboken
- [14] Hripcsak G, Rothschild AS (2005) Agreement, the f-measure, and reliability in information retrieval. *Journal of the American Medical Informatics Association* 12(3):296–298

- [15] Lui M, Baldwin T (2014) Accurate language identification of Twitter messages.
In: Proceedings of EACL, pp 593–602