UDC: 378.14:005.35:378.4(100)

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# INTERNATIONAL EXPERIENCE OF ESG GOVERNANCE MODELS IN HIGHER EDUCATION INSTITUTIONS: A COMPARATIVE ANALYSIS AND IMPLICATIONS FOR UZBEKISTAN

**ABSTRACT**

The global diffusion of Environmental, Social, and Governance (ESG) principles into higher education management has given rise to diverse institutional models across regional and developmental contexts. This article presents a systematic comparative analysis of ESG governance models in higher education institutions (HEIs) across four major global regions — Europe, North America, Asia-Pacific, and developing economies — with the purpose of identifying transferable lessons for Uzbekistan's expanding HEI sector. Three principal ESG governance typologies are delineated: Institutional (full strategic integration), Functional (dedicated but partially integrated units), and Reactive (externally-driven, episodic compliance). The European model, characterised by top-down institutional integration and strong normative frameworks, is contrasted with the bottom-up, endowment-driven North American model and the technology-intensive, state-led Asian model. Drawing on a community-level 15-year longitudinal case study of Bukhara State University [3] and its validated Pentagonal Integral Model (PIM), the article demonstrates how resource-constrained HEIs in Uzbekistan can leverage international ranking participation (UI GreenMetric) as the optimal entry point for ESG adoption, following the I→G→A→S→E activation sequence. International benchmarking systems (THE Impact Rankings, UI GreenMetric, QS Sustainability, STARS) are compared for their methodological relevance to Uzbekistan's institutional context. The article advances a hybrid ESG governance model for Uzbekistan's HEIs, combining European institutional design principles, North American community engagement practices, and Asian digital monitoring technologies.

***Keywords:*** *ESG governance models, higher education institutions, comparative analysis, Pentagonal Integral Model, UI GreenMetric, sustainability integration, Uzbekistan, international benchmarking, smart campus, educational tourism.*

## 1. INTRODUCTION

The integration of Environmental, Social, and Governance (ESG) principles into higher education management has transitioned from a peripheral institutional concern to a central strategic imperative within two decades. What originated as a corporate risk-assessment framework has been progressively adopted by universities worldwide as a structured approach to managing their environmental footprint, social responsibilities, and governance accountability [1,27]. The accelerating scholarly attention to this field — from 7 publications in 2005 to 121 in 2024 — reflects the growing consensus that HEIs are uniquely positioned to serve dual roles: as significant resource consumers and as transformative agents for sustainable societal change [34].

This convergence, however, conceals profound divergences in how ESG principles are operationalised across different regional, institutional, and developmental contexts. European universities pursue systematic, institutionally-embedded ESG frameworks supported by robust legal architectures, while North American institutions rely more heavily on voluntary initiatives and endowment-driven investment decisions. Asian universities increasingly leverage technological innovation and state-directed policy, while HEIs in developing economies navigate resource constraints and capacity limitations under the growing pressure of international ranking systems [19].

Uzbekistan's higher education system — having expanded from 77 to 248 HEIs between 2017 and 2025, with gross enrolment increasing from 9% to 47.5% — finds itself at a critical institutional juncture where ESG governance frameworks have not kept pace with quantitative growth [29]. Bespalyy et al. [19] confirm that Central Asian HEIs lag significantly behind EU counterparts in sustainability awareness and integration, with only 56% of Uzbek educators aware of UN SDGs. The pioneering exception documented by Juraev et al. [3] — Bukhara State University's 15-year GreenMetric participation and the validated Pentagonal Integral Model (PIM) — demonstrates that context-appropriate ESG frameworks can generate measurable outcomes even in resource-constrained environments.

This article addresses three interconnected research questions: (1) What are the dominant typologies of ESG governance models in global HEIs and what institutional conditions shape their adoption? (2) What are the distinctive characteristics, strengths, and limitations of ESG models across European, North American, Asian, and developing economy contexts? (3) What transferable lessons and strategic recommendations emerge from international comparative analysis for Uzbekistan's HEI sector?

## 2. LITERATURE REVIEW

The academic literature on ESG integration in higher education has developed along two converging trajectories. The first — rooted in corporate governance and sustainability finance — examines how ESG frameworks developed for business contexts can be adapted to the university setting [36]. The second — grounded in higher education studies — explores how sustainability principles can be systematically embedded in institutional strategy, curriculum, operations, and community engagement [24,27].

Leal Filho et al. [1] identify transformative leadership commitment, cross-disciplinary faculty capacity, and dedicated institutional units as the three critical enablers of sustainability integration. Lozano et al. [20] find that while policy commitment is widespread, implementation depth varies enormously — with most universities exhibiting fragmented, project-level initiatives rather than systemic institutional integration. Hassan and Ahmad [34] confirm through a systematic literature review that governance quality is the primary determinant of whether sustainability commitments translate into operational outcomes.

The Pentagonal Integral Model (PIM) developed by Juraev et al. [3] through a 15-year longitudinal study of Bukhara State University constitutes the most directly relevant theoretical contribution for the present comparative analysis. The PIM conceptualises ESG operationalisation through five interconnected subsystems — Ecological, Social, Governance, Academic, and International — with quantified Dynamic Equilibrium Coefficients (DECs) mapping interaction strengths between subsystems. The model's central finding — that the I→G pathway (coefficient 0.79) represents the optimal low-cost entry point for resource-constrained institutions — has direct implications for how Uzbekistan's HEIs should sequence their ESG adoption strategies.

The role of international ranking systems as ESG drivers has received growing scholarly attention. Alberti et al. [26] provide a critical review of the UI GreenMetric methodology, noting both its standardisation value and potential self-selection biases among participating institutions. Rosli and Azmi [25] demonstrate that accounting undergraduates exposed to ESG-integrated curricula exhibit significantly higher sustainability literacy — confirming the Academic-Social (A→S = 0.83) pathway documented in the PIM. Alenezi and Alanazi [35] specifically address the curricular dimension, showing how ESG values can be embedded within existing degree programme structures without requiring wholesale curriculum redesign.

The nexus between university ESG performance and educational tourism — a dimension particularly relevant to Uzbekistan's heritage-rich regions — is documented by Omonova et al. [28], who demonstrate using panel data from 50 countries that university reputation ($\beta = 0.673$) is the single most influential factor determining international student mobility. Long and Juraev [29] further document how governance capacity gaps represent the binding constraint on Uzbekistan's HEI internationalisation aspirations — reinforcing the centrality of the G subsystem in the ESG adoption sequence.

## 3. RESEARCH METHODOLOGY

This study employs a mixed comparative research design combining systematic literature analysis, document-based case study comparison, and expert-informed typological assessment. The methodology draws on three complementary approaches.

First, a systematic review of grey literature and institutional sustainability reports was conducted, covering 25 leading universities across four regions — Europe (6 institutions), North America (6 institutions), Asia-Pacific (7 institutions), and developing economies (6 institutions). The selection process was conducted in two stages. In the first stage, an initial pool of universities was generated from those participating in the THE Impact Rankings, UI GreenMetric, or QS Sustainability Rankings at the top-100 level in at least one of these three systems (not all three simultaneously, as few developing-economy institutions qualify for all three). In the second stage, purposive selection within each regional stratum was applied to achieve four specific objectives: (a) representing each principal ESG governance typology (Institutional, Functional, Reactive); (b) covering different institutional sizes and resource profiles; (c) ensuring geographic diversity within each region; and (d) including at least one institution with a comparable ESG development trajectory to Uzbekistan's HEIs. The inclusion of Stellenbosch University, University of Malaya, and Kenyatta University, for example, reflects typological criteria (c) and (d) rather than simultaneous top-100 qualification across all three ranking systems. All selected institutions had publicly accessible sustainability reports published between 2021 and 2025.

Second, a three-dimensional ESG scoring matrix was applied to each institution, assessing Environmental (E), Social (S), and Governance (G) performance on a 0–10 scale based on published metrics. The scoring process was conducted as follows: (a) an initial score was derived mechanically from three verifiable metrics per dimension — E-score from renewable energy share, carbon target year, and GreenMetric performance tier; S-score from female academic staff share, documented community engagement volumes, and graduate sustainability employment rates; G-score from ESG report publication frequency, supervisory board independence rating, and strategic plan ESG integration depth; (b) each metric was mapped to the rubric presented in Table 6 (Appendix), which specifies score bands 1–2, 3–4, 5–6, 7–8, and 9–10 with explicit criteria for each dimension; (c) scores were reviewed by two independent colleagues with sustainability governance expertise; (d) disagreements of more than one point on any dimension were resolved through discussion with reference to primary documentary evidence. The rubric in Table 6 is derived from established sustainability assessment frameworks (GRI, UI GreenMetric, STARS) to ensure methodological grounding beyond purely subjective expert judgment. The Pentagonal Integral Model (PIM) developed by Juraev et al. [3] informed the subsystem operationalisation methodology.

Third, the Bukhara State University case was incorporated as the primary analytical reference point for Central Asian HEIs, drawing on the comprehensive 15-year longitudinal dataset documented in the PIM study [3] and supplemented by the GIS-based sustainable urban analysis conducted for Bukhara by Farmanov et al. [33]. This integration allows direct comparison between internationally benchmarked ESG performance and the institutional conditions of Uzbekistan's leading sustainability-active HEI.

## 4. RESULTS

### 4.1. Typology of ESG Governance Models in Global HEIs

The comparative analysis of institutional approaches across 25 leading universities worldwide yields three principal ESG governance typologies, differentiated by the depth of strategic integration, organisational structure, and primary driving mechanisms. These are presented in Table 1 below.

**Table 1. Typology of ESG Governance Models in Higher Education Institutions**

| Model Type | Key Characteristics | Representative Universities | Region | Integration Depth |
|---|---|---|---|---|
| **Institutional Model** | ESG fully integrated into governance structure; dedicated Sustainability Vice-Rector; ESG is central to the strategic plan | ETH Zurich, University of Copenhagen, University of Melbourne | Europe, Oceania | Transformative |
| **Functional Model** | ESG operates as a dedicated unit/office; Sustainability Centre or Office exists; partially integrated into the strategic plan | Harvard, MIT, University of Toronto, University of Tokyo | North America, Asia | Integrative |
| **Reactive Model** | ESG activities driven primarily by external pressures — rankings, accreditation, state policy; no systematic strategy | Most universities in developing economies | Central Asia, Africa, Latin America | Adaptive |

*Table 1. Author's compilation based on international sustainability reports and rankings data. Developed in alignment with the PIM typological framework [3].*

The Institutional Model represents the most advanced form of ESG integration, characterised by structural embedding at the highest governance level — typically a Vice-Rector or Pro-Vice-Chancellor for Sustainability — and ESG's centrality in the multi-year strategic plan. This model aligns with the full 'Transformative' maturity phase in the PIM framework [3]. The Functional Model involves a dedicated sustainability office or centre with operational autonomy, but operates as an add-on rather than a core governance function. The Reactive Model — prevalent in developing and Central Asian economies — responds episodically to external pressures without a systematic strategic framework. Juraev et al. [3] note that Bukhara State University is in transition from Reactive to Adaptive-Integrative, having achieved a 72.38% GreenMetric score through the I→G→A activation sequence.

### 4.2. European Higher Education Institutions: Institutional Model Leadership

European universities have established global leadership in ESG governance integration, distinguished by the systematic embeddedness of sustainability principles at the institutional, faculty, and curriculum levels. The Bologna Process framework, European Standards and Guidelines for Quality Assurance (ESG 2015) [23], and the Horizon Europe research funding architecture [5] collectively create a regulatory ecosystem that incentivises ESG adoption at the system rather than the institutional level alone. Table 2 presents the key indicators for the leading European institutions examined in this study.

**Table 2. ESG Governance Indicators of Leading European Universities (2023–2024)**

| University | THE Impact Ranking | GreenMetric Rank | ESG Model | Strategic Target | Key Achievement |
|---|---|---|---|---|---|
| **ETH Zurich (Switzerland)** | Top 10 | Top 20 | Institutional | Carbon neutral by 2035 | Sustainability Vice-Rector since 2008; 350+ ESG courses; 40% graduates |

| University | THE Impact Ranking | GreenMetric Rank | ESG Model | Strategic Target | Key Achievement |
|---|---|---|---|---|---|
| | | | | | with sustainability competencies |
| **University of Copenhagen (Denmark)** | Top 5 | Top 15 | Institutional | Carbon neutral by 2030 | 100% renewable energy; 35% energy consumption reduction; Green Campus flagship programme |
| **University of Oxford (UK)** | Top 10 | Top 30 | Institutional | Net-zero Scope 1&2 by 2035 | Smith School of Enterprise and the Environment; Environmental Sustainability Strategy 2021–2035 |
| **Wageningen University (Netherlands)** | Top 3 | Top 5 | Institutional | Living Lab campus | Global leader in agricultural and ecological research; all programmes linked to SDGs |
| **University of Helsinki (Finland)** | Top 15 | Top 25 | Institutional | Cross-cutting sustainability in all faculties | 200+ sustainability courses; mandatory component of all bachelor programmes since 2023 |
| **Lund University (Sweden)** | Top 20 | Top 40 | Institutional | All new programmes include sustainability competencies | Sustainability Forum platform; sustainability mandatory in new programmes since 2020 |

*Table 2. Compiled from THE Impact Rankings 2023, UI GreenMetric 2024, and institutional sustainability reports [6,7,8,21,26].*

ETH Zurich's Institutional Model — with its Sustainability Vice-Rector position established in 2008 and 350+ ESG courses [6] — represents the most advanced governance architecture documented in this study. The University of Copenhagen's 100% renewable energy achievement through the Green Campus programme [7] demonstrates the operational outcomes achievable within the Institutional Model. The key European lesson for Uzbekistan is architectural: ESG governance integration requires structural embedding, not programme-level programming.

The European University Association's (EUA) network of 800+ sustainability-active universities and the COPERNICUS Alliance of 300+ member institutions provide coordinating infrastructure that amplifies individual institutional efforts — a network model offering a template for system-level ESG coordination applicable to Uzbekistan's MHESI.

**4.3. North American Model: Endowment-Driven and Bottom-Up**

North American universities have pursued ESG integration primarily through the Functional Model, leveraging their substantial endowment funds as both financial instruments and powerful signalling mechanisms. Harvard University's 2021 decision to fully divest its USD 41 billion endowment from fossil fuel companies [10] represents perhaps the most consequential institutional ESG action of the past decade — generating cascading effects across the sector. MIT's Plan for Action on Climate Change [11] and Stanford's USD 1.7 billion Doerr School of Sustainability similarly evidence the scale of resource mobilisation available to research-intensive North American HEIs.

The distinctive feature of the North American model is its bottom-up character: the Fossil Free campaign's achievement of divestment commitments from 1,500+ educational institutions globally originated in student and alumni advocacy at Harvard and MIT [10]. The University of Toronto's STARS Gold certification [12] illustrates the use of external assessment systems to drive internal improvement cycles. For Uzbekistan's HEIs, the North American model offers a specific and replicable lesson: student ESG councils, ecological clubs, and green campus initiatives represent low-cost, high-impact mechanisms for building ESG culture from within the institution. Juraev and Sobirov [31] demonstrate the curriculum-level entry point through content-based instructional models integrating tourism and economics — a model that simultaneously builds academic capacity (A subsystem) and social awareness (S subsystem).

**4.4. Asia-Pacific Model: Technology-Intensive and State-Led**

Asia-Pacific universities occupy a hybrid position in the ESG governance typology: combining elements of the Institutional Model in governance architecture with a distinctive technology-intensive approach to operational ESG management that sets them apart from both European and North American peers. The region's approach is fundamentally state-led — Japan's Green Innovation Fund, China's 2060 carbon neutrality commitment, and Singapore's Green Plan 2030 all translate directly into university ESG mandates [13].

The National University of Singapore's achievement of Southeast Asia's first net-zero energy educational building (SDE4) [15] and KAIST's IoT-integrated real-time energy, water, and waste monitoring systems represent the technological frontier of campus ESG management. Nanyang Technological University's AI-based energy management system — which achieved a 20% reduction in energy consumption [15] — exemplifies how digital technology can substitute for human monitoring capacity in resource-constrained settings. Tsinghua University's 50MWt solar installation covering 25% of campus energy needs [14] demonstrates the ecological-international (E→I = 0.85) pathway's validity: visible environmental achievements attract international academic partnerships.

This Asian technological approach carries particular strategic relevance for Uzbekistan's HEIs, where IoT sensors, AI-based analysis systems, and smart campus solutions can deliver operational ESG monitoring capabilities at lower unit costs than full staffing solutions. The Bukhara State University case [3] already validates this: the SuvniAsra 2.0 platform's AI-driven water management system and the 2,000+ solar panel installation generating 1,314,000 kWh annually demonstrate that Central Asian HEIs can adopt Asian technological solutions without the full resource envelope of their Singapore and Korean counterparts. Farmanov et al.'s [33] GIS-based sustainable transport analysis for Bukhara further illustrates how digital spatial tools can support both the Ecological and Governance ESG dimensions in UNESCO heritage city contexts.

**4.5. Developing Economies: Lessons from Constrained Contexts**

Universities in developing economies navigate ESG integration under conditions that more closely approximate Uzbekistan's institutional reality than European or North American models.

To enable systematic comparison with other regional models, Table 2b presents the key quantitative ESG indicators for the developing-economy universities examined in this study.

**Table 2b. ESG Governance Indicators of Leading Universities in Developing Economies (2023–2024)**

| University | THE Impact Ranking | GreenMetric Rank (Africa/LatAm) | ESG Model | ESG Sub-scores (E/S/G out of 10)* | Key Achievement / Limitation |
|---|---|---|---|---|---|
| **Cape Town University (South Africa)** | Top 150 globally | ~270th globally; 1st in Africa | Adaptive | **7/10 \| 8/10 \| 7/10** | First African university to divest from fossil fuels (2018); strong social equity mandate; limited operational E-infrastructure |
| **Stellenbosch University (South Africa)** | Top 200 globally | ~310th globally; 2nd in Africa | Adaptive | **6/10 \| 7/10 \| 6/10** | Consistent UI GreenMetric Africa top-3; Centre for Sustainability Science; limited renewable energy share (~18%) |
| **University of São Paulo (Brazil)** | Top 200 globally | ~80th globally; 1st in Latin America | Adaptive–Integrative | **7/10 \| 6/10 \| 7/10** | Sustainability Superintendent role since 2012; GreenMetric LatAm leader; governance transparency gaps persist |
| **University of Malaya (Malaysia)** | Top 300 globally | ~30th globally; SE Asia leader | Adaptive–Integrative | **7/10 \| 6/10 \| 7/10** | UI GreenMetric Top 30 globally; Living Labs sustainability programme; community engagement limited by institutional culture |
| **Kenyatta University (Kenya)** | Not ranked | ~600th globally | Reactive | **4/10 \| 5/10 \| 4/10** | Solar campus initiative; 10,000+ trees planted; no formal ESG reporting; Green Economy programme operational |

*Table 2b. Compiled from UI GreenMetric 2024, THE Impact Rankings 2023, and institutional sustainability reports [18,21,26]. *E/S/G sub-scores out of 10; scored using the rubric in Table 6 (Appendix). See Section 3 for scoring methodology.*

Table 2b reveals that developing-economy universities are not uniformly 'Reactive': the University of São Paulo and University of Malaya occupy an 'Adaptive–Integrative' position with GreenMetric global rankings in the top 30–100, comparable to or exceeding some European mid-tier institutions. Cape Town University's divestment decision [18] — the first African university to do so in 2018 — demonstrates that institutional leadership commitment (G subsystem) can drive ESG transformation ahead of resource availability. The governance score differentiates the more advanced from the less advanced cases: Cape Town and São Paulo both score 7/10 on G-component, reflecting formal governance structures and documented annual reporting; Kenyatta University's 4/10 G-score reflects its reactive, project-level ESG activity.

The University of Malaya's Living Labs programme — enabling applied sustainability research on the university campus itself — provides a model for how HEIs with limited research funding can generate ESG knowledge through operational experimentation rather than traditional funded research. São Paulo University's Sustainability Superintendent position [18], maintained since 2012, shows that institutional governance roles can sustain ESG momentum through political and resource cycles that frequently disrupt project-level initiatives.

The ARIUSA regional network model in Latin America and the African Green University Network offer templates for the Central Asian regional cooperation framework that Juraev et al. [3] identify as absent in the region. Bespalyy et al. [19] confirm that Central Asian universities currently lack the inter-institutional exchange infrastructure available to their EU counterparts. The ecotourism sector — documented by Turobovich et al. [32] as a marketing development opportunity for Uzbekistan's regions — represents an underutilised bridge between HEI Environmental component development and community economic benefit: Bukhara's UNESCO World Heritage status, analysed through GIS tools by Farmanov et al. [33], positions BuxDU to leverage its ecological sustainability achievements for both academic-international (E→I) and corporate-community partnership outcomes.

**4.6. Regional Comparative Analysis: Cross-Model Synthesis**

Table 3 synthesises the key comparative dimensions across all five contexts examined — Europe, North America, Asia-Pacific, developing economies, Central Asia, and Bukhara State University as the primary reference institution — enabling systematic identification of transferable elements for Uzbekistan's HEI sector.

**Table 3. Comparative Analysis of ESG Governance Models by Region (including BuxDU reference case*)**

| Criterion | Europe | North America | Asia-Pacific | Developing Economies | Central Asia | BuxDU* |
|---|---|---|---|---|---|---|
| **ESG Model Type** | Institutional | Functional | Mixed | Reactive | Reactive | Transitional |
| **Primary Driver** | State policy & institutional culture | Alumni & student initiative; endowment | State policy & tech innovation | International rankings & donors | International rankings | GreenMetric + PIM |
| **Integration Level** | High — strategic | Medium-high — functional | Medium — fast-growing | Low — initial | Low — emerging | Medium (72.38%) |

| Criterion | Europe | North America | Asia-Pacific | Developing Economies | Central Asia | BuxDU* |
|---|---|---|---|---|---|---|
| **Strengths** | Systematic approach; legal basis; standards | Financial resources; innovation | Tech solutions; smart campus | Growth potential; international cooperation | Reform momentum | Renewable energy 58%; PIM framework |
| **Weaknesses** | Bureaucratic processes; low flexibility | Decentralised; inconsistent | Cultural barriers; slow integration | Resource scarcity; limited capacity | Institutional capacity gaps | Waste management 55.56% |
| **Approach Direction** | Top-down | Bottom-up | State-led | External pressure-driven | Policy-driven | Hybrid (I→G→A→S→E) |

*Table 3. Author's compilation based on institutional sustainability reports, international rankings data, and [3,19,21,26]. *BuxDU data drawn from Juraev et al. [3] and Farmanov et al. [33].*

Table 3 reveals that Bukhara State University's 'Transitional' classification — between Reactive and Integrative — accurately reflects both its achievements (72.38% GreenMetric score, 58% renewable energy, 401st globally) and its remaining development reserve (waste management at 55.56%, governance transparency at 6/10). The I→G→A activation sequence documented in the PIM [3] provides a region-specific pathway that diverges from the top-down European model while incorporating Asia-Pacific technological tools. Omonova et al.'s [28] documentation of university reputation as the dominant driver of educational tourism outcomes (β = 0.673) further reinforces the strategic case for international visibility: ESG performance in rankings is not merely an environmental or social benefit but a driver of institutional economic sustainability.

**4.7. International ESG Ranking Systems: Methodological Comparative Analysis**

International benchmarking systems represent a key institutional driver across all regional models examined. Table 4 presents a comparative assessment of the four principal ESG ranking systems relevant to Uzbekistan's HEIs.

**Table 4. Comparative Analysis of International ESG Ranking Systems for Higher Education**

| Ranking System | Since | Participating Institutions | Coverage | ESG Components Assessed | Strategic Value for Uzbekistan |
|---|---|---|---|---|---|
| **THE Impact Rankings** | 2019 | 1,700+ universities from 115 countries | All 17 UN SDGs | All ESG components (E, S, G); teaching, research, outreach, operations | High: most comprehensive; recognised globally |
| **UI GreenMetric World Rankings** | 2010 | 1,745 universities from 105 | 6 environmental categories | Primarily E-component; some G and S elements | Priority: free participation; BuxDU ranked 401st |

| Ranking System | Since | Participating Institutions | Coverage | ESG Components Assessed | Strategic Value for Uzbekistan |
|---|---|---|---|---|---|
| | | countries (2025) | | | globally (72.38%) |
| **QS Sustainability Rankings** | 2022 | 700+ universities globally | Environmental + social impact | E and S components; graduate outcomes; societal influence | High: growing global recognition |
| **STARS (AASHE)** | 2007 | 400+ universities (North America-focused) | 4 academic/operational categories | Full ESG coverage; Bronze/Silver/Gold/Platinum levels | Supplementary: methodology transferable |

*Table 4. Compiled from THE Impact Rankings [21], UI GreenMetric [37], AASHE STARS [9], QS Rankings data and critical literature review [26].*

The UI GreenMetric system holds particular strategic significance for Uzbekistan: participation is free, entirely online, and based on self-reported data that also serves as an internal diagnostic tool. Bukhara State University's 15-year GreenMetric trajectory (ranked 401st globally among 1,745 universities in 2025) [3,38] provides a validated proof-of-concept for Central Asian HEIs. Uzbekistan's GreenMetric participation has expanded from 1 institution in 2019 to 79 universities in 2025 with 38 achieving top-1,000 status — a trend that Alberti et al. [26] confirm as evidence of genuine sustainability commitment growth rather than pure ranking-gaming behaviour. For Uzbekistan's HEIs at the current development stage, a sequential engagement strategy is recommended: begin with UI GreenMetric (free, accessible, diagnostic), progress to QS Sustainability Rankings as institutional data capacity develops, and target THE Impact Rankings as the long-term quality benchmark.

**4.8. University ESG Maturity Assessment: International Benchmark Including BuxDU**

Table 5 presents an expert ESG maturity assessment of six representative universities — five international leaders and Bukhara State University — across the three ESG dimensions (E, S, G) on a 0–10 scale. Scores were assigned using the rubric specified in Table 6 (Appendix), drawing on published metrics (GreenMetric data, THE Impact Rankings, institutional sustainability reports, and Juraev et al. [3]) with independent review by two sustainability governance specialists. Dimension-level sub-scores are the arithmetic mean of the three indicator values for each dimension, rounded to the nearest integer. The scoring was conducted by the author and reviewed by colleagues with sustainability governance expertise; disagreements were resolved by reference to primary documentary evidence.

**Table 5. ESG Maturity Assessment: International Leaders and Bukhara State University (Expert Scoring, 0–10)**

| University | E (score/10) | S (score/10) | G (score/10) | Overall Level | Maturity Phase | Key Differentiator |
|---|---|---|---|---|---|---|
| ETH Zurich | 9/10 | 8/10 | 9/10 | High | Transformative | Sustainability Vice-Rector; 350+ ESG courses |
| Harvard University | 8/10 | 9/10 | 8/10 | High | Integrative | USD 41B endowment |

| University | E (score/10) | S (score/10) | G (score/10) | Overall Level | Maturity Phase | Key Differentiator |
|---|---|---|---|---|---|---|
| | | | | | | divestment from fossil fuels |
| NUS Singapore | 9/10 | 8/10 | 9/10 | High | Integrative | 1st net-zero building in SE Asia; Office of Sustainability |
| University of Tokyo | 8/10 | 7/10 | 8/10 | Medium-High | Integrative | UTokyo Compass 2022; 40% energy reduction by 2030 |
| Cape Town University | 7/10 | 8/10 | 7/10 | Medium | Adaptive | 1st African university to divest from fossil fuels (2018) |
| **Bukhara State University *** | 7/10 | 6/10 | 6/10 | Medium | Adaptive→Integrative | GreenMetric 401st globally; PIM framework; 58% renewable energy |

*Table 5. Expert scoring using the rubric in Table 6 (Appendix). Scoring dimensions: E = renewable energy share + carbon target year + GreenMetric tier; S = female academic staff share + community engagement + green employment; G = ESG report frequency + board independence + strategic plan integration. *BuxDU data from Juraev et al. [3] and GreenMetric 2025 [37,38].*

Table 5 positions Bukhara State University in the 'Adaptive→Integrative' transition phase — below the international ESG leaders but demonstrably above the Reactive baseline characteristic of most Central Asian HEIs. The E-score of 7/10 reflects BuxDU's 58% renewable energy achievement and 80% water efficiency, which represent above-average performance even by international standards in their respective categories [3]. The S-score of 6/10 reflects the 28.4% green graduate employment rate and 8,480 annual student programme participants, with remaining development reserve in gender equity and formal community partnership mechanisms. The G-score of 6/10 reflects the March 2024 Sustainability Policy adoption and ICT monitoring systems, balanced against the limited governance transparency of the broader Uzbekistan HEI sector [29]. The PIM's dynamic equilibrium coefficient framework provides a more granular reading: the strongest existing pathways (E→I: 0.85; A→S: 0.83; G→E: 0.81) confirm that the institution has successfully activated the virtuous cycle at its three strongest nodes, while the weakest remaining pathway (S→E: 0.58) identifies social programme development as the next priority investment [3].

## 5. DISCUSSION

The comparative analysis yields a coherent pattern with clear implications: ESG governance model effectiveness is not determined by resource availability alone but by the strategic sequencing of subsystem activation, the institutional architecture supporting that sequencing, and the depth of normative embedding that sustains it over time. ETH Zurich and Harvard have built their ESG systems over 15–20 years of consistent institutional commitment [6,10] — confirming Juraev et al.'s [3] finding from the BuxDU longitudinal study that the virtuous cycle (A→S→G→E→I→A) requires multi-year activation before self-reinforcing dynamics emerge.

For Uzbekistan's HEIs, the central strategic insight from this comparative analysis is the need for a differentiated, sequenced hybrid model rather than the wholesale adoption of any single regional approach. Three design principles emerge. First, European institutional architecture: the creation of formal ESG governance structures — sustainability coordination units, strategic plan integration, and MHESI-level monitoring — provides the systemic embeddedness without which individual initiatives remain episodic. Second, North American community engagement: student ESG councils, ecological clubs, and content-based curriculum integration [31] generate the social legitimacy (S subsystem) that sustains political support for governance investment. The corporate tourism linkage dimension documented by Isokova and Juraev [30] represents a concrete community engagement mechanism through which HEIs build S-component capital. Third, Asian digital monitoring: IoT sensor networks, AI-based consumption management, and GIS-based spatial analysis [33] provide the operational ESG monitoring capability that enables evidence-based governance without requiring large dedicated staff establishments.

The educational tourism dimension deserves particular emphasis in the Uzbekistan context. Omonova et al. [28] demonstrate that university reputation is the dominant driver of international student mobility; their finding that 'quality visible, not just real' drives tourism flows applies directly to UNESCO heritage cities like Bukhara. Farmanov et al.'s [33] GIS analysis of sustainable transport networks in Bukhara positions HEIs as actors within the city's broader sustainability ecosystem. The ecotourism marketing potential identified by Turobovich et al. [32] for Uzbekistan's regions provides a further commercial bridge between HEI E-component development and community economic benefit — validating the E→I→S pathway as commercially viable.

The governance deficit remains the most significant systemic barrier. Cape Town University achieved transformative governance decisions in a resource-constrained African context; Brazil's São Paulo University maintained a dedicated Sustainability Superintendent for over a decade with limited funding [18]. The binding constraint, as identified by Bespalyy et al. [19] and Long and Juraev [29], is institutional leadership commitment. The PIM's G→E coefficient (0.81) quantifies this relationship: formal governance adoption is the strongest predictor of subsequent environmental investment.

## 6. CONCLUSIONS

This article has conducted a systematic comparative analysis of ESG governance models across four global regions and advanced an evidence-based strategic framework for Uzbekistan's HEI sector. Six principal conclusions are advanced.

First, three ESG governance typologies — Institutional, Functional, and Reactive — emerge from the international comparative analysis. Uzbekistan's HEIs predominantly operate in the Reactive mode, with Bukhara State University representing the most advanced transitional case — validated through the 15-year PIM study [3].

Second, the European Institutional Model represents the long-term aspirational architecture. However, direct model transfer is inappropriate: the Bologna Process, EUA network infrastructure, and Horizon Europe funding that sustain European ESG integration are not available to Central Asian HEIs on equivalent terms.

Third, the North American and Asian models provide specific, replicable mechanisms immediately applicable to Uzbekistan's context: student ESG councils and content-based

curriculum integration [31] from the North American tradition; IoT-based monitoring and AI-driven resource management from the Asian tradition; and GIS-based sustainable infrastructure analysis [33] from the emerging smart city research tradition.

Fourth, international ranking participation — specifically UI GreenMetric, which is free and accessible — serves as the validated optimal entry point for ESG adoption in resource-constrained HEIs. BuxDU's 15-year GreenMetric trajectory demonstrates a replicable pathway from 0 to 401st global rank while simultaneously building all five PIM subsystems [3].

Fifth, the educational tourism-ESG nexus documented by Omonova et al. [28] and the urban sustainability challenges analysed by Farmanov et al. [33] confirm that ESG performance in Uzbekistan's heritage cities is an economic development strategy, not merely an environmental compliance exercise.

Sixth, this article recommends a three-phase hybrid ESG governance roadmap: Phase I (2025–2027): International Activation; Phase II (2028–2030): Governance Integration; Phase III (2031–2035): Institutional Embedding. These conclusions provide an empirically grounded comparative foundation for the development of Uzbekistan's national ESG governance standards.

**APPENDIX: Table 6. ESG Maturity Scoring Rubric (0–10 Scale)**

The following rubric was applied to assign E, S, and G sub-scores to all universities in Table 5. Scores for each dimension represent the arithmetic mean of three verifiable indicator values mapped to the bands below.

**Table 6. ESG Expert Scoring Rubric — Criteria by Score Band and Dimension**

| Score Band | E (Environmental) Criteria | S (Social) Criteria | G (Governance) Criteria |
|---|---|---|---|
| **9–10** | ≥60% renewable energy; carbon-neutral commitment by ≤2030; GreenMetric Top 20; net-zero building on campus | ≥50% female academic staff; structured community engagement >500 events/year; ≥25% graduates in green employment | Annual ESG report (GRI/SASB); dedicated Sustainability Vice-Rector; ESG fully in strategic plan; supervisory board active |
| **7–8** | 30–60% renewable energy; net-zero target by 2035; GreenMetric Top 50; >40% energy from low-carbon sources | 40–50% female academic staff; some community engagement; 15–25% graduates in sustainability-related employment | Sustainability office established; ESG partially integrated in strategic plan; annual reporting in progress |
| **5–6** | 10–30% renewable energy; energy reduction targets documented; GreenMetric Top 500; carbon reporting begun | 30–40% female academic staff; limited community programmes; <15% graduates in sustainability-related employment | Sustainability committee exists; ad hoc ESG reporting; governance policies adopted but not consistently implemented |
| **3–4** | <10% renewable; no formal decarbonisation target; GreenMetric participation only; fossil fuels dominant | <30% female academic staff; no systematic community engagement; no green employment tracking | Policy documents only; no dedicated sustainability unit; reporting informal or absent |
| **1–2** | No renewable targets; no GreenMetric participation; no environmental monitoring | No gender equity data; no community engagement; no social ESG policies | No ESG governance structure; no reporting obligations; reactive to accreditation only |

*Table 6. Author's rubric, derived from GRI Standards, UI GreenMetric assessment categories, STARS methodology (AASHE), and THE Impact Rankings SDG indicators. Two independent reviewers applied the rubric; disagreements resolved by reference to primary institutional documents.*

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