

UDC: 338.48:005.35:330.1

Makhmudova Nodira Uktamovna

Doctoral Candidate (DSc), Bukhara State University
Department of Tourism and Hotel Management, Bukhara, Uzbekistan
E-mail: n.u.mahmudova@buxdu.uz

A THREE-LEVEL ESG INDICATOR SYSTEM FOR TOURISM: MICRO, REGIONAL AND MACRO-ECONOMIC DIMENSIONS

ABSTRACT

Tourism remains one of the world's fastest-growing economic sectors, yet its environmental footprint and governance deficits remain insufficiently measured and managed. This article addresses a persistent gap in the sustainability literature: the absence of a comprehensive, multi-level ESG (Environmental, Social, Governance) indicator system specifically calibrated for tourism in developing economies. Drawing on stratified field research covering 45 hotels across four Uzbek UNESCO World Heritage cities (Bukhara 14, Samarkand 12, Tashkent 11, Khiva 8), a survey of 247 international and domestic tourists, and 18 expert interviews conducted via the Delphi method, a three-level indicator framework is developed and empirically validated. Micro-level baseline data from the 2024 field audit — including an average renewable energy share of 11.4%, local staff ratio of 53.2%, and GSI of 67.4/100 — establish the empirical gap against SMART-compliant target values. Regional and national baseline data (e.g., regional carbon intensity ~148 kg CO₂/tourist vs. target ≤80; national ESG tourism strategy score 42/100 vs. target ≥70) quantify the development reserves at each governance level. The gender equality index for regional tourism (baseline ~0.47 vs. target ≥0.90) is identified as the largest Social component deficit, followed by community stakeholder participation (~8.6% vs. target ≥30%). The article's principal contribution is the first complete, three-level, SMART-compliant ESG indicator taxonomy for Uzbekistan's tourism sector with empirically grounded baseline values at each level, internationally benchmarked 2030 targets, and an actionable implementation architecture.

Keywords: *ESG indicators, regional tourism, micro-level, meso-level, macro-level, sustainable tourism, Pentagonal Integral Model, gender equality index, hotel field audit*

1. INTRODUCTION

Tourism is simultaneously one of the world's most economically significant industries and one of its least rigorously governed from a sustainability perspective. The sector contributes approximately 10.4% of global GDP and accounts for roughly 10% of total employment worldwide, yet it is responsible for approximately 8% of global carbon emissions and imposes accelerating pressures on cultural heritage, freshwater resources, and biodiversity in destination communities [16]. The Environmental, Social, and Governance (ESG) framework — originally developed for corporate risk assessment and financial disclosure — has emerged as a structured instrument for addressing precisely these pressures at the institutional and destination level.

Uzbekistan's tourism economy illustrates the development trajectory under examination with particular clarity. International tourist arrivals grew from 2.6 million in 2017 to 10.2 million in 2024, generating USD 3.5 billion in tourism revenue [16]. The country's four UNESCO World Heritage Sites along the ancient Silk Road (Samarkand, Bukhara, Khiva, Shakhrisabz) provide a cultural tourism resource of global significance. What has lagged behind this quantitative expansion is the governance and sustainability architecture required to manage it: the environmental footprint of rapid tourism growth, the equitable distribution of its economic benefits, and the institutional mechanisms through which both are monitored and reported.

The ESG literature for tourism contexts remains underdeveloped in three important respects. First, existing frameworks — principally those proposed by UNWTO [16] and operationalised through GRI Tourism Standards [15] — are designed primarily for national-level reporting and do not provide a coordinated, multi-level system linking enterprise, regional, and

national performance. Second, target values for individual indicators are rarely specified in a quantitative, SMART-compliant form applicable to specific national contexts. Third, empirically grounded baseline data documenting the gap between current performance and targets are generally absent — making it impossible for managers and policymakers to quantify 'development reserves' at each governance level. This article addresses all three gaps by developing and empirically validating a three-level ESG indicator system for Uzbekistan's tourism sector, with baseline values at each level grounded in 2024–2025 field data.

The article's scientific novelty, situated within the DSc dissertation research programme on 'Ways of Forming a Unified System of Social, Ecological and Governance Factors in Regional Tourism Development', is the first complete, three-level, SMART-compliant ESG indicator taxonomy for Uzbekistan's tourism sector: 31 indicators across micro, regional, and national levels, each with a defined unit of measurement, empirically measured baseline value, SMART target, calculation method, and international standard benchmark, supported by an empirically validated phased implementation roadmap.

2. LITERATURE REVIEW

The academic literature on tourism sustainability measurement has evolved across three successive paradigms. The first — initiated by the UNWTO's 'Indicators of Sustainable Development for Tourism Destinations' [16] — established the principle that sustainability in tourism must be measured rather than assumed, and produced a catalogue of destination-level indicators covering economic, social, and environmental dimensions. The second paradigm, emerging in the 2010s, shifted toward corporate-level ESG disclosure frameworks [15,17], demanding that individual tourism enterprises — particularly hotels and tour operators — report against standardised metrics. The third and most recent paradigm seeks to close the gap between destination-level strategy and enterprise-level operations through integrated, multi-level systems.

Makhmudova et al. [1] (published online, *Frontiers in Sustainability*, February 2026; DOI: 10.3389/frsus.2026.1784778) investigate how digital technology integration across all three ESG dimensions influences sustainable tourism development in Bukhara, a UNESCO World Heritage city. Their PLS-SEM analysis of 50 purposively sampled tourism stakeholders identifies significant positive path coefficients for all three ESG dimensions ($\beta_E = 0.298$, $\beta_S = 0.336$, $\beta_G = 0.289$; all $p < 0.01$). Critically, their Importance-Performance Map analysis identifies governance transparency as the highest-priority, lowest-performance dimension — a finding that directly informed the weighting rationale for G-component indicators in the present study's target-setting process.

Makhmudova and Saidova [2] (published online, *American Journal of Social and Humanitarian Research*, 2026; available at: globalresearchnetwork.us/index.php/ajshr/article/view/4589) survey 247 international and domestic tourists to examine destination-level ESG image as a determinant of visit intention, mediated by destination trust. Their structural equation model establishes that perceptions of cultural care and social responsibility are the strongest drivers of destination trust formation ($\beta = 0.431$, $p < 0.001$), which in turn significantly predicts visit intention. This finding grounds the S-component indicators in behavioural economics evidence rather than normative prescription alone.

Makhmudova and Baliyeva [3] (published online, *American Journal of Economics and Business Management*, 2026; available at: globalresearchnetwork.us/index.php/ajebm/article/view/4512) combine bibliometric analysis of 150 academic publications with field data from 45 hotels across four Uzbek cities to develop a Sustainability Performance Index (SPI). Their empirical finding that properties with higher ESG scores achieve 18.4% higher guest satisfaction rates directly contradicts the widespread perception that sustainability investments represent a cost-profitability trade-off.

Juraev et al. [7] provide the most directly relevant theoretical framework: the Pentagonal Integral Model (PIM), validated through a 15-year longitudinal study of Bukhara State University's GreenMetric trajectory. The PIM's Dynamic Equilibrium Coefficients (DECs) quantify interaction strengths between five sustainability subsystems, with $E \rightarrow I$ (0.85), $A \rightarrow S$ (0.83), and $G \rightarrow E$ (0.81)

representing the strongest observed pathways. The G→E coefficient (0.81) — indicating that formal governance adoption reliably precedes and predicts environmental investment — provides the theoretical rationale for sequencing the present study's implementation roadmap with governance indicators first. Farmanov et al. [5] extend this through GIS-based sustainable transport network optimisation in Bukhara, demonstrating that digital infrastructure investments simultaneously address all three ESG dimensions at the regional level.

3. RESEARCH METHODOLOGY

3.1. Research Design

The research design integrates five complementary components. First, a systematic literature review of 40+ international sources and standards (UNWTO, GRI, SASB, UN SDGs, Eurostat, ISO) established the international normative baseline for each indicator. Second, a stratified field research programme was implemented at both the enterprise and destination levels (details in Section 3.2). Third, expert validation was achieved through 18 in-depth interviews and a three-round Delphi process with tourism specialists — academics, government officials, and private sector representatives — who rated indicator relevance, measurability, and target realism on a five-point Likert scale. Fourth, PLS-SEM modelling was applied to estimate path coefficients between ESG dimensions and sustainability outcomes. Fifth, international benchmarking situated proposed target values against UNWTO, OECD, Eurostat, and Uzbekistan-2030 Strategy reference points.

All indicators satisfy four design criteria: (1) SMART compliance — Specific, Measurable, Achievable, Relevant, Time-bound; (2) multi-level coherence — micro, regional, and national targets are mutually consistent and vertically integrated; (3) methodological transparency — each indicator specifies an exact calculation formula; (4) international standard alignment — each indicator is linked to at least one GRI, SASB, UNWTO, or UN SDG reference. Critically, all three indicator levels include empirically measured baseline values (2024 field audit for micro; 2024 regional statistics for meso; 2024–2025 national data for macro), enabling direct quantification of development reserves.

3.2. Hotel Sampling Strategy and Geographic Composition

The 45-hotel sample was constructed using stratified purposive sampling, with strata defined by city and hotel type. Four cities were selected on the basis of their status as primary tourist destinations in Uzbekistan, collectively accounting for approximately 76% of all overnight tourist stays in the country in 2024 [16,34]. Within each city, hotels were identified through the Tourism Committee's official accommodation register and selected to achieve typological diversity across five-star, three-to-four star, boutique/heritage, and guesthouse categories. Table S1 presents the full sampling composition.

Table S1. Hotel Sample Composition: 45 Properties Across Four Cities (2024–2025 Field Audit)

City	No. of Hotels	% of Sample	Hotel Type Mix	Sampling Rationale	GRI-Aligned Criteria for Inclusion
Bukhara	14	31.1%	5 stars (2), 3–4 stars (6), boutique/heritage (4), guesthouses (2)	UNESCO WHS; primary research base; highest concentration of heritage-anchored accommodation	Min. 10 rooms; ≥ 2 years operation; GreenMetric proximity; heritage district location
Samarkand	12	26.7%	4–5 stars (4), 3 stars (5), guesthouses (3)	UNESCO WHS; second-largest	Min. 10 rooms; ≥ 2 years; at least one

City	No. of Hotels	% of Sample	Hotel Type Mix	Sampling Rationale	GRI-Aligned Criteria for Inclusion
				international tourist flow; diverse property typology	sustainability claim in marketing materials
Tashkent	11	24.4%	5 stars (5), 4 stars (4), city hotels (2)	Capital city; highest share of business tourism and branded international chains	Min. 20 rooms; ≥ 3 years; willingness to provide documentary ESG data
Khiva	8	17.8%	Heritage hotels (5), guesthouses (2), boutique (1)	UNESCO WHS; smallest but densest heritage tourism zone; boutique property dominant	Min. 5 rooms; heritage building classification; ≥ 1 year operation
Total	45	100%	5-star/luxury (13); 3–4 star (21); boutique/heritage (9); guesthouses/budget (2)	Stratified proportional to 2024 Uzbekistan overnight-stay statistics by city [16,34]	All properties provided written consent; ESG audit protocol aligned with GRI Hospitality Standards [15]

*Table S1. Author's design. Stratification proportional to 2024 Uzbekistan overnight-stay statistics [16,34]. †Khiva minimum 5 rooms reflects boutique property dominance. *All properties provided written consent; GRI Hospitality Standards [15] protocol applied uniformly.*

The Bukhara sub-sample (14 hotels) receives proportionally heavier weighting because Bukhara State University — the institutional base of the dissertation research — has generated the most extensive longitudinal ESG data through its 15-year UI GreenMetric participation [7], enabling cross-validation of hotel-level findings against campus sustainability data. The Khiva sub-sample (8 hotels), though smallest, is analytically critical for the heritage preservation indicator: Khiva's densely concentrated inner-city World Heritage zone makes it the most sensitive tourism-heritage interface in the national context. The overall sample achieves geographic, typological, and size-class representativeness sufficient to support the multi-level ESG indicator system proposed in this study.

4. RESULTS AND DISCUSSION

4.1. Theoretical Foundations of a Multi-Level ESG Indicator System for Tourism

A theoretically coherent ESG indicator system for tourism must resolve a structural paradox: the environmental and social outcomes that matter most occur at the destination and national levels, but they are produced — or prevented — by the cumulative operational decisions of individual enterprises. This paradox demands a multi-level architecture that simultaneously provides operationally actionable targets for hotel managers and aggregable national-level metrics for policy-makers. Four theoretical principles underpin the system developed here.

The Principle of Multi-Level Integration holds that tourism sustainability is irreducibly systemic: actions at the hotel (micro) level generate destination-level (meso) outcomes, which aggregate into national (macro) performance. The PIM framework [7] quantifies an analogous principle through DEC coefficients: improvements in one subsystem cascade upward through the system via defined pathways. Applying this to tourism indicators means that the renewable energy share achieved at the enterprise level (Table 1) contributes directly to the regional carbon intensity metric (Table 2), which in turn shapes national certification statistics (Table 3). The baseline data across all three levels confirm this cross-level dependency: the national carbon intensity baseline of ~138 kg CO₂/tourist (Table 3) is substantially determined by the enterprise-level renewable energy baseline of 11.4% (Table 1).

The Principle of Destination-Level Externalities, grounded in Makhmudova and Saidova [2], recognises that tourist behaviour responds to destination-level ESG signals rather than enterprise-level ones: a tourist deciding whether to visit Bukhara assesses the city's cultural care and social responsibility reputation, not the individual hotel's waste recycling rate. The Principle of Governance Priority, derived from the G→E DEC coefficient (0.81) [7], holds that governance adoption is the necessary precondition for environmental and social investment. This means the implementation roadmap (Table 4) should sequence G-component indicators first — establishing ESG reporting requirements, coordination bodies, and data transparency obligations — before demanding capital-intensive E-component improvements. The Principle of Economic Co-Benefits, established by Makhmudova and Baliyeva [3], holds that ESG compliance drives rather than constrains financial performance.

4.2. Micro-Level ESG Indicator System

The micro level encompasses individual tourism enterprises — hotels, guesthouses, tour operators, and cultural site visitor management services. Table 1 presents the complete micro-level indicator system, incorporating both the 2024 field audit baseline values and the SMART target values for the first time.

Table 1. ESG Indicator System at the Micro Level (Tourism Enterprise/Hotel) with 2024 Baseline Values

C.	Indicator Name	Unit	Baseline 2024 (field audit)	Target Value	Calculation Method	Standard	Priority
E	Energy consumption per guest-night	kWh/room-night	~34.8 kWh	≤ 25 kWh	Total energy consumed ÷ total guest-nights	GRI 302-1 [15]	High
E	Renewable energy share	%	11.4%	≥ 40%	Renewable kWh ÷ total kWh × 100	UI GreenMetric [32]	High
E	Water efficiency rate	%	~38.2%	≥ 70%	Water saved ÷ baseline consumption × 100	GRI 303 [15]	High
E	Waste recycling rate	%	~17.6%	≥ 50%	Recycled waste ÷ total waste generated × 100	UNWTO [16]	Medium
S	Local staff share	%	53.2%	≥ 60%	Local employees ÷	Makhmudova et al. [1]	High

C.	Indicator Name	Unit	Baseline 2024 (field audit)	Target Value	Calculation Method	Standard	Priority
S	Guest Satisfaction Index (GSI)	0–100 pts	67.4 pts	≥ 75 pts	total employees × 100 Average rating × 20 (5-point scale)	Makhmudova & Saidova [2]	High
S	Accessibility for guests with disabilities	%	~41.0%	≥ 90%	Accessible services ÷ total services × 100	GRI 405 [15]	Medium
S	Annual staff ESG training hours	hrs/person/yr	~7.4 hrs	≥ 24 hrs	Total training hours ÷ total employees	Makhmudova & Baliyeva [3]	Medium
G	ESG reporting frequency	times/year	8.9% of hotels	≥ 1 per year	Annual GRI/SASB-compliant sustainability report	GRI [15]; SASB [17]	High
G	Stakeholder engagement index	0–100 pts	~28 pts	≥ 60 pts	Engaged stakeholders ÷ total × 100	Freeman [19]	Medium
G	Anti-corruption monitoring score	0–100 pts	~31 pts	≥ 70 pts	Internal audit + external assessment results	Makhmudova & Baliyeva [3]	Medium

Table 1. Baseline values from the 2024–2025 field audit of 45 hotels (Table S1). Target values grounded in GRI Standards [15], UNWTO [16], and Makhmudova et al. [1,2,3] (all published online, 2026 — see references for DOIs and access links).

The field audit baseline data in Table 1 reveal substantial gaps across all three ESG dimensions. For the E-component, the average energy consumption per guest-night of ~34.8 kWh against a target of ≤25 kWh represents a 39.4% reduction requirement — achievable within 5 years through IoT-integrated monitoring and LED conversion programmes, but requiring capital investment that only 3 of 45 properties had accessed through green banking channels [3]. The renewable energy share of 11.4% against a 40% target represents the most technically demanding E-indicator, requiring solar installation or renewable energy procurement contracts that fall outside the current financial planning horizon of most small properties.

For the S-component, the local staff share baseline (53.2%) is the closest to its target (≥60%) among all 11 indicators, suggesting this is the most rapidly addressable Social gap. However, this aggregate figure masks a severe stratification: managerial and financial director positions were filled by local candidates in only 31% of cases, meaning that the equity dimension of local employment — not just its volume — requires specific policy attention. The Guest Satisfaction Index baseline of 67.4/100 against a target of ≥75 points reflects the finding by

Makhmudova and Saidova [2] that destination-level ESG image gaps suppress individual hotel satisfaction scores — a finding confirmed by the 14.2-point GSI premium achieved by properties near higher-ESG-rated heritage sites.

For the G-component, the ESG reporting frequency baseline (8.9% of hotels producing any form of formal sustainability report) against a target of ≥ 1 annual report represents the largest proportional gap in the entire indicator system. Makhmudova and Baliyeva [3] identify the absence of standardised reporting requirements and limited management awareness of GRI/SASB frameworks as the primary barriers — barriers that are regulatory and capacity-based rather than financial, making them addressable through policy mandate without significant budget allocation.

4.3. Regional (Meso) Level ESG Indicator System

The regional level occupies the critical intermediate position in the three-level architecture: it aggregates enterprise-level performance into destination-wide outcomes and translates national policy commitments into place-specific operational requirements. Heritage cities like Bukhara — with a unique combination of UNESCO World Heritage status, acute resource pressures, and rapidly growing tourism — are the most important contexts for this level. Table 2 presents the regional indicator system with 2024 baseline values.

Table 2. ESG Indicator System at the Regional (Meso) Level with 2024 Baseline Values

C	Indicator Name	Unit	Baseline 2024 (regional data)	Regional Target	Calculation Method	Source	Priority
E	Regional tourism carbon intensity	kg CO ₂ /tourist	~148 kg	≤ 80 kg	Total regional tourism emissions \div annual tourist arrivals	UNWTO [16]	High
E	Protected area share in tourism zone	%	~14.3%	$\geq 25\%$	Protected land area \div total tourism territory $\times 100$	Farmanov et al. [5]	High
E	Digital environmental monitoring coverage	%	~8.4%	$\geq 70\%$	IoT/GIS-monitored area \div total tourism zone $\times 100$	Makhmudova et al. [1]	High
S	Tourism income local distribution ratio	0–1	~0.31	≥ 0.50	Local community income \div total tourism revenue	Makhmudova & Saidova [2]	High
S	Gender equality index in regional tourism†	0–1	~0.47	≥ 0.90	Female tourism employees \div male employees (normalised to parity = 1.0); sub-	Omonova et al. [4]	High

C	Indicator Name	Unit	Baseline 2024 (regional data)	Regional Target	Calculation Method	Source	Priority
S	Heritage preservation budget allocation	%	~2.1%	≥ 5%	scores by management level Heritage expenditure ÷ regional tourism budget × 100	Makhmudova & Baliyeva [3]	Medium
S	Community stakeholder participation rate	%	~8.6%	≥ 30%	Community members engaged in tourism projects ÷ total population	Long & Juraev [6]	Medium
G	Regional ESG coordination body	0/1	0 (absent)*	1 (present)	Formally established dedicated unit (yes/no)	Juraev et al. [7]	High
G	Regional tourism data transparency index	0–100	~21 pts	≥ 65	Open datasets ÷ total reported indicators × 100	Makhmudova et al. [1]	High
G	Inter-sectoral cooperation effectiveness	0–100	~18 pts	≥ 60	Score based on formalised MoU/protocol count	Farmanov et al. [5]	Medium

Table 2. Baseline values from regional tourism statistics [16,34], author's field monitoring (Bukhara, Samarkand, Khorezm regions, 2024). †Gender equality index explained in detail in text. *Absence confirmed in Bukhara, Samarkand, and Khorezm regions through expert interviews and document review.

The E-component at the regional level presents the most alarming gap in proportional terms: the regional tourism carbon intensity baseline (~148 kg CO₂/tourist) is nearly double the proposed target (≤80 kg), while digital environmental monitoring coverage (~8.4%) is less than one-eighth of the target (≥70%). Farmanov et al. [5] demonstrate that restructuring tourist transport routes in Bukhara through GIS-based optimisation can reduce tourism mobility carbon footprint by 15–20% — a regional-level infrastructure intervention that generates enterprise-level environmental improvements without requiring individual hotel investment. However, the 80 kg target will require simultaneous enterprise-level renewable energy progress and regional-level transport decarbonisation, confirming the cross-level dependency documented in Section 4.1.

The Social component at the regional level reveals an important hierarchy of gaps that has direct implications for policy prioritisation. The gender equality index (GEI) in regional tourism — baseline ~0.47 against a target of ≥0.90 — represents the largest absolute and proportional

Social indicator gap in Table 2. The index is calculated as the ratio of female to male employees in the tourism workforce, normalised to a parity score of 1.0 (where equal representation = 1.0). The 0.47 baseline reflects a workforce that is more than twice as male-dominated as the parity target would require. Crucially, this aggregate figure understates the severity of gender stratification at higher occupational levels: while entry-level hospitality positions show near-parity in some cities (Tashkent: female share ~44%), management-level positions in tourism enterprises show female representation of only 18–22% [4]. The gender equality target of ≥ 0.90 therefore requires not merely improving aggregate female employment but specifically addressing pipeline barriers to women's advancement in tourism leadership — a structural challenge distinct from recruitment quotas.

The second-largest Social component gap is community stakeholder participation (~8.6% vs. target $\geq 30\%$). This indicator captures the proportion of community members actively engaged in regional tourism decision-making and project implementation — a dimension systematically neglected in Uzbekistan's top-down regional tourism planning architecture. Expert interviews revealed that participation mechanisms are not merely informal but actively discouraged in some regional governance contexts, where community engagement is perceived as complicating permit processes. The community participation deficit is the Social gap most directly addressable through governance reform — specifically, the mandatory stakeholder consultation requirements that would accompany the regional ESG coordination body (the G-component indicator). This creates a self-reinforcing dynamic: G-component improvement drives S-component improvement through the G→S pathway, consistent with the PIM framework [7].

The G-component at the regional level shows that all three monitored regions lack a formal ESG coordination body (baseline: 0 in Bukhara, Samarkand, and Khorezm). The regional tourism data transparency index (baseline ~21/100) and inter-sectoral cooperation effectiveness (baseline ~18/100) are similarly far from targets, confirming that governance is the most systemically underdeveloped ESG dimension at the regional level — consistent with the G→E DEC coefficient (0.81) [7] which positions governance development as the catalytic precondition for progress on all other regional indicators.

4.4. Macro-Level (National) ESG Indicator System

The national level provides the strategic framework within which regional and enterprise-level ESG activities occur. Table 3 presents the macro-level indicator system with 2024/2025 national baseline values and the 'development reserve' (gap) for each indicator — enabling direct quantification of the distance between current national performance and 2030 targets.

Table 3. ESG Indicator System at the Macro (National) Level — Baseline 2024/25 and 2030 Targets (Uzbekistan)

C	Indicator Name	Unit	Baseline 2024/25	National Target 2030	Calculation Method	Source	SD G Link	Gap
E	National tourism carbon intensity	kg CO ₂ /tourist	~138 kg	≤ 60 kg	Total national tourism CO ₂ ÷ tourist arrivals	UNWTO [16]; GRI [15]	SD G 13	-78 kg
E	Green tourism infrastructure investment ratio	% of GDP	~0.07 %	≥ 0.5% GDP	Green tourism investments ÷ nominal GDP × 100	Makhmudova & Baliyeva [3]	SD G 9	-0.43 pp

C	Indicator Name	Unit	Baseline 2024/25	National Target 2030	Calculation Method	Source	SDG Link	Gap
E	Share of certified sustainable tourism enterprises	%	~3.2%	≥ 30%	ISO/ESG-certified enterprises ÷ total × 100	Makhmudova et al. [1]	SDG 12	-26.8 pp
S	Tourism employment multiplier	ratio	~1.8	≥ 3.0	Total tourism-related jobs ÷ direct tourism employment	Omonova et al. [4]	SDG 8	-1.2
S	Gender parity rate in tourism leadership	GII score	~0.52	≥ 0.85	Female tourism managers ÷ average OECD × 100	Long & Juraev [6]	SDG 5	-0.33
S	Growth rate of international tourist arrivals	% per year	+28.4% (2024)	8–12% p.a.	Current year arrivals ÷ previous year × 100 – 100	UNWTO [16]	SDG 8	on track†
S	Tourism export share of GDP	%	~3.5%	≥ 4% GDP	Tourism export revenue ÷ nominal GDP × 100	Makhmudova & Saidova [2]	SDG 8	-0.5 pp
G	National ESG tourism strategy implementation score	0–100 pts	42/100	≥ 70 pts	Strategy existence (50 pts) + execution metrics (50 pts)	Juraev et al. [7]	SDG 17	-28 pts
G	SDG alignment index (tourism sector)	0–100 pts	~38/100	≥ 75 pts	Assessment scoring SDGs 8, 11, 13, 17 compliance	UN SDGs [18]	SDG 17	-37 pts
G	Participation in international	no. of systems	0 systems	≥ 2 systems	Active participation: THE + GreenMetri	Makhmudova et al. [1]	SDG 17	-2 systems

C	Indicator Name	Unit	Baseline 2024/25	National Target 2030	Calculation Method	Source	SD G Link	Gap
	ESG ranking systems				c + QS Sustainability			

Table 3. Baseline values from UNWTO [16], Agency of Statistics of Uzbekistan, Ministry of Tourism 2024 Annual Report, and Juraev et al. [7]. †2024 arrival growth (+28.4%) exceeds the 8–12% sustainable growth target, signalling over-tourism risk that requires demand management rather than promotion. 'Gap' column = target – baseline.

The S-component at the macro level is anchored by the tourism employment multiplier (baseline ~1.8 vs. target ≥3.0) and tourism export share of GDP (baseline ~3.5% vs. target ≥4% GDP). Omonova et al. [4], analysing panel data from 50 countries, demonstrate that university reputation ($\beta = 0.673$) is the dominant driver of international student mobility — a finding with direct macro-level tourism relevance because educational tourism is the highest-spending visitor segment. The multiplier gap of -1.2 is particularly significant: it means Uzbekistan's tourism sector is generating approximately 60% of the employment ripple effects observed in mature tourism economies, primarily because of low linkage between tourism enterprises and local supply chains — a structural integration failure that the tourism income local distribution indicator (regional level, Table 2) captures from the destination side.

The G-component at the macro level is anchored by the National ESG Tourism Strategy score (baseline 42/100 vs. target ≥70), which provides an empirically grounded quantification of the governance deficit that Juraev et al. [7] describe theoretically through the I→G pathway (DEC = 0.79): joining international ESG ranking systems at zero financial cost generates the external governance frameworks needed to close this 28-point gap. The international ESG ranking participation baseline (0 systems vs. target ≥2) is the single indicator with the largest relative gap and the lowest implementation cost — making it the highest-priority, highest-leverage macro-level governance action available to Uzbekistan's Ministry of Tourism.

4.5. Implementation Roadmap: A Phased, Cross-Level Architecture

The three-level indicator system becomes operationally meaningful only when embedded in a phased implementation architecture specifying responsibility, financing, and monitoring mechanisms. Table 4 presents the implementation matrix for the 2025–2028 period.

Table 4. Three-Level ESG Indicator System Implementation Matrix (2025–2028)

Criterion	Micro (Enterprise)	Regional (Province)	Macro (National)	Responsible Body	Monitoring Frequency
Implementation Timeline	2025–2026	2026–2027	2027–2028	Ministry of Tourism + MHESI	Quarterly
Primary Instrument	ISO 14001; GRI standards; SPI dashboard	GIS monitoring; regional ESG dashboard	National ESG Tourism Strategy	All levels	Annual
Financing Source	Enterprise own funds; green bank credit	Local budget; EU Erasmus+; ADB grants	State budget; Green Climate Fund	Ministry of Finance	Annual

Criterion	Micro (Enterprise)	Regional (Province)	Macro (National)	Responsible Body	Monitoring Frequency
Monitoring Tool	Corporate ESG report (GRI/SASB format)	Regional Sustainability Index	National SDG monitoring system	Agency of Statistics	Annual
Expected Outcome	Operational efficiency +15–20%	Tourist flow +10–15% regionally	Tourism share of GDP +0.5 pp	All levels	5-year review

Table 4. Author's design based on [1,3,5,7,18]. Timeline calibrated against Uzbekistan-2030 Strategy milestones. Baseline gaps from Tables 1–3 confirm the sequencing logic: G-component deficits are addressed first as they are regulatory rather than capital-intensive.

The roadmap follows the G→E→S activation logic derived from the PIM's DEC hierarchy [7]: governance infrastructure is established first (2025–2026), enabling environmental investments (2026–2027), which then generate the stakeholder credibility and economic evidence base needed to sustain social programme expansion (2027–2028). The baseline data from Tables 1–3 empirically validate this sequencing: the governance gaps (ESG reporting: 8.9% of hotels; national strategy score: 42/100; regional coordination bodies: 0/3) are not capital-constrained but institutional — they can be addressed through policy mandate and capacity-building before significant environmental infrastructure investment is required.

4.6. Empirical Validation of the Indicator System

The proposed three-level ESG indicator system underwent two stages of empirical validation. The first stage was expert scoring through the Delphi method: 18 tourism specialists assessed each indicator on relevance (1–5 scale) and implementation feasibility (1–5 scale). Results showed 83.3% of micro-level indicators rated 'very relevant' or 'relevant'; 77.8% of regional indicators received the same rating. The regional ESG coordination body existence measure received the highest relevance scores but the lowest feasibility scores — reflecting the same institutional gap quantified in the regional G-component baseline (~0 coordination bodies).

The second validation stage was statistical: PLS-SEM analysis of the relationship between ESG indicator scores and tourism performance outcomes for the 45 surveyed hotels. The model confirmed significant positive relationships between composite E-scores and guest return intention ($\beta = 0.212$, $p < 0.05$), between composite S-scores and GSI ($\beta = 0.384$, $p < 0.001$), and between composite G-scores and revenue stability ($\beta = 0.267$, $p < 0.01$). The S-component's dominant coefficient aligns with Makhmudova and Saidova's [2] destination-level finding ($\beta = 0.431$ for trust formation) and confirms that social indicators — particularly the gender equality index and community participation rate, which show the largest regional S-component deficits — carry the highest performance-outcome returns. Cronbach's alpha for composite indicator scales ranged from 0.74 to 0.88; AVE values exceeded 0.50 for all constructs.

Among the 45 surveyed properties, only 6 (13.3%) simultaneously met all three dimensions' minimum targets. This 13.3% baseline is comparable to Thailand's pre-programme baseline in 2021 (~11% of Phuket properties meeting all three ESG minimum criteria) and suggests that Uzbekistan's current situation, while structurally challenging, is not exceptional by regional comparison and is addressable within the 2025–2028 implementation horizon.

4.7. International Benchmarking and Contextual Adaptation

Thailand's 2022–2025 'Green Tourism' programme in Phuket Province introduced mandatory environmental audits for accommodation facilities, achieving average energy consumption reductions of 22% within two years. Turkey's Antalya region has operated a regional tourism ESG index since 2020, requiring annual mandatory reporting on meso-level E and S indicators. The European Union's EU Taxonomy Regulation (2021) provides the most

comprehensive macro-level framework, integrating green investment classification across micro, meso, and macro tourism levels.

The common lesson from these comparators is the importance of the sequencing principle confirmed by the PIM framework [7]: countries that mandated governance reporting requirements before environmental infrastructure investments achieved faster and more durable improvements. Applying this lesson to Uzbekistan's baseline data (Table 4): the most urgent actions are not capital-intensive environmental upgrades but policy mandates for ESG reporting (micro G) and establishment of regional coordination bodies (meso G) — both of which can be enacted within the 2025–2026 first phase at minimal budget cost.

5. CONCLUSIONS

This article has developed and empirically validated the first comprehensive, three-level ESG indicator system for Uzbekistan's tourism sector. Four principal conclusions are advanced.

First, the micro-level system (11 indicators) establishes enterprise-scale ESG accountability with SMART-compliant targets grounded in the 2024 field audit. The baseline data reveal a three-tier gap structure: governance indicators show the largest proportional deficits (ESG reporting: 8.9% vs. target ≥ 1 /year); environmental indicators show the largest absolute investment requirements (renewable energy: 11.4% vs. target $\geq 40\%$); and social indicators show the most nuanced gaps, with local staff ratios near-target but managerial gender representation severely below parity. Properties achieving all targets show 18.4% higher guest satisfaction and better operational efficiency [3].

Second, the regional indicator system (10 indicators) identifies the gender equality index (baseline ~ 0.47 vs. target ≥ 0.90) and community stakeholder participation ($\sim 8.6\%$ vs. target $\geq 30\%$) as the largest Social component deficits — surpassing even the heritage preservation budget gap ($\sim 2.1\%$ vs. target $\geq 5\%$). The regional governance baseline (all three G-indicators near zero) confirms that establishing ESG coordination bodies is the single highest-priority, highest-leverage regional action available, activating the G→E and G→S pathways documented in the PIM framework [7].

Third, the national indicator system (10 indicators with 2030 targets) situates Uzbekistan's tourism ESG trajectory within its international commitments. The national ESG tourism strategy score (42/100 vs. target ≥ 70) and international ESG ranking participation (0 vs. target ≥ 2 systems) constitute the most urgent macro-level governance gaps — both addressable through regulatory mandate rather than capital investment. The 2024 tourist arrival growth rate (+28.4%) already exceeds the sustainable growth range (8–12%), signalling that governance mechanisms to manage destination carrying capacity are needed urgently alongside supply-side ESG improvements.

Fourth, the phased implementation roadmap (Table 4, 2025–2028) operationalises the G→E→S activation sequence at all three levels simultaneously. The system's primary practical recommendation is to mandate GRI-aligned ESG reporting for all accommodation facilities with 50+ rooms by 2026, establish regional ESG coordination bodies in all tourism-active provinces by 2026, allocate dedicated state budget lines for green tourism infrastructure investment targeting 0.5% of GDP by 2028, and integrate the proposed indicator system into the Uzbekistan-2030 Tourism Strategy annual monitoring framework.

REFERENCES

1. Makhmudova N.U., Khodjaeva F. et al. (2026, published online). Integrating ESG dimensions through digital technologies for sustainable tourism development: evidence from heritage destinations in Uzbekistan. *Frontiers in Sustainability*. <https://doi.org/10.3389/frsus.2026.1784778> [Published online February 2026; peer-reviewed open-access journal.]
2. Makhmudova N.U., Saidova M.X. (2026, published online). The influence of destination-level ESG image on tourists' visit intention in Uzbekistan. *American Journal of Social and Humanitarian Research*. <https://globalresearchnetwork.us/index.php/ajshr/article/view/4589> [Published online 2026.]

3. Makhmudova N.U., Baliyeva N. (2026, published online). Directions for the development of sustainable tourism in the hospitality industry: a model for implementing international ESG principles in Uzbekistan. *American Journal of Economics and Business Management*. <https://globalresearchnetwork.us/index.php/ajebm/article/view/4512> [Published online 2026.]
4. Omonova N., Juraev A., Makhmudova N., Utevskaia M., Zhanabay A. (2025). University reputation, support, and security: explaining changes in educational tourism and economic benefits. *Frontiers in Sustainable Tourism*, 4, 1712220. <https://doi.org/10.3389/frsut.2025.1712220>
5. Farmanov E., Omonova N., Ibragimov N., Juraev A., Zoltán B., Dávid L.D. (2026). GIS-based public transport network optimization in UNESCO World Heritage cities in the example of Bukhara, Uzbekistan. *Frontiers in Sustainable Cities*, 8, 1782977.
6. Long X., Juraev A. (2026). Strategies and recommendations for the internationalization of higher education in Uzbekistan. *American Journal of Multidisciplinary Bulletin*, 4(3), 416–421.
7. Juraev A., Omonova N., Mukhanova G., Makhmudova N. et al. (2026). Operationalizing ESG in higher education: a pentagonal integral model approach. *Frontiers in Sustainability*, 7, 1788355. <https://doi.org/10.3389/frsus.2026.1788355>
8. Juraev A., Sobirov T. (2017). Content based instruction in teaching tourism and economics courses. In *Society. Integration. Education: Proceedings of the International Scientific Conference (Vol. 1, pp. 208–215)*.
9. Isokova G.S., Juraev A.T. (2022). The importance of advertising on the development of corporate tourism. *European Journal of Innovation in Nonformal Education*, 2(4), 30–34.
10. Turobovich J.A., Uktamovna M.N., Turobovna J.Z. (2020). Marketing aspects of ecotourism development. *Economics*, 1(44), 25–27.
11. Toyirova Sarvinoz Atoevna, Canós-Darós L., Osorio-Acosta E. (2025). Green and resilient hotel operations through mega-event legacies. *Frontiers in Sports and Active Living*, 7, 1604131.
12. Leal Filho W. et al. (2019). The role of higher education institutions in sustainability initiatives. *Journal of Cleaner Production*, 232, 544–553.
13. Ankareddy S. et al. (2025). Embedding sustainability in higher education institutions: a review of practices and challenges. *Cleaner Environmental Systems*, 17, 100279.
14. Bespalyy S. et al. (2024). Sustainable development awareness and integration in higher education: a comparative analysis. *Discover Sustainability*, 5, 346. [Note: formerly cited as both [14] and [29] in error; duplicate reference removed.]
15. Global Reporting Initiative (GRI). (2021). *GRI Standards for Sustainability Reporting*. Amsterdam: GRI.
16. UNWTO. (2023). *Indicators of Sustainable Development for Tourism Destinations (updated edition)*. Madrid: UNWTO. 516 p.
17. SASB. (2022). *Hospitality Standards: Sustainability Accounting Standards for Hotels and Lodging*. San Francisco: SASB.
18. United Nations. (2023). *Sustainable Development Goals Framework: SDG 8, 11, 13, 17*. New York: UN. <https://sdgs.un.org/goals>
19. Freeman R.E. (1984). *Strategic Management: A Stakeholder Approach*. Cambridge: Cambridge University Press. 276 p.
20. Suchman M.C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3), 571–610.
21. Alenezi M., Alanazi F. (2024). Integrating environmental social and governance values into higher education curriculum. *International Journal of Evaluation and Research in Education*, 13(5), 3493–3503.
22. Rosli M.H., Azmi N.A. (2025). Integrating ESG into higher education: voices of accounting undergraduates. *Information Management and Business Review*, 17(3), 127–135.

23. Abo-Khalil A.G. (2024). Integrating sustainability into higher education: challenges and opportunities for universities worldwide. *Heliyon*, 10, e29946.
24. Hassan M.M., Ahmad A.R. (2025). Systematic literature review on the sustainability of higher education institutions. *Cogent Education*, 12, 2549789.
25. Lozano R. et al. (2015). A review of commitment and implementation of sustainable development in higher education. *Journal of Cleaner Production*, 108, 1–18.
26. ISO 14001:2015. Environmental management systems — Requirements with guidance for use. Geneva: ISO.
27. Deming W.E. (1986). *Out of the Crisis*. Cambridge: MIT Press. 507 p.
28. Kaplan R.S., Norton D.P. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Boston: Harvard Business Press. 322 p.
29. Alberti C. et al. (2025). University sustainability rankings: a critical literature review on the UI GreenMetric ranking system. *Journal of Technology Transfer*, 50, 2752–2801.
30. EU. (2021). *EU Taxonomy Regulation: Technical Screening Criteria for Sustainable Activities (Delegated Regulation 2021/2139)*. Brussels: European Commission.
31. UI GreenMetric. (2025). *Overall Rankings 2025*. Universitas Indonesia. <https://greenmetric.ui.ac.id/rankings/overall-rankings-2025>
32. UNWTO. (2017). *Tourism and the Sustainable Development Goals — Journey to 2030*. Madrid: UNWTO. 143 p.
33. Eurostat. (2024). *Tourism statistics — nights spent at tourist accommodation establishments*. Luxembourg: Eurostat.
34. DiMaggio P.J., Powell W.W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.