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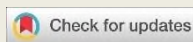
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IMPLEMENTING THE UN STATISTICAL STANDARD MST IN UZBEKISTAN: DATA GAP ANALYSIS AND INTEGRATION PATHWAYS

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 <https://doi.org/10.5281/zenodo.19322155>

Key words: *tourism sustainability, national statistical system, MST framework, environmental statistics, energy intensity, environmental impacts of tourism, value chain.*

ABSTRACT

This study assesses the readiness of Uzbekistan's national statistical system to implement the United Nations *Measuring the Sustainability of Tourism (MST)* framework. The research applies a two-stage methodology, including a gap analysis of official environmental statistics and a proxy-based estimation of energy intensity using sectoral data (NACE Rev. 2). The findings reveal significant statistical limitations, particularly the inability to disaggregate tourism-related environmental impacts from aggregated national data. Empirical results indicate elevated energy intensity in accommodation (4.85%) and especially in arts, entertainment, and recreation (5.66%), with a strong dependence on electricity, highlighting hidden resource pressures beyond transport. The study identifies structural inefficiencies and "distributed environmental responsibility" within the tourism value chain. It proposes a stepwise implementation roadmap based on administrative reforms, digital integration via the E-mehmon platform, and economic incentives. The conclusion emphasizes that without MST adoption, tourism growth risks generating unmonitored environmental costs, undermining long-term sustainability.

O'ZBEKISTONDA BMTNING MST BO'YICHA STATISTIK STANDARTINI JORIY ETISH: MA'LUMOTLARDAGI BO'SHLIQLAR TAHLILI VA INTEGRATSIYA YO'LLARI

Kalit so'zlar: *turizm barqarorligi, milliy statistika tizimi, MST doirasini, ekologik statistika, energiya intensivligi, turizmning ekologik ta'siri, qiymat zanjiri.*

ANNOTATSIYA

Ushbu tadqiqot O'zbekiston milliy statistika tizimining Birlashgan Millatlar Tashkilotining turizm barqarorligini o'lchash (*Measuring the Sustainability of Tourism, MST*) konseptual doirasini joriy etishga tayyorgarlik darajasini baholaydi. Tadqiqot ikki bosqichli metodologiyani qo'llaydi, jumladan rasmiy ekologik statistika bo'yicha tafovutlar tahlili (gap analysis) hamda tarmoqlar kesimidagi ma'lumotlar (NACE Rev. 2) asosida proksi-ko'rsatkichlar orqali energiya intensivligini baholash. Natijalar muhim statistik cheklovlarni aniqlaydi, xususan turizm bilan bog'liq ekologik ta'sirlarni agregatsiyalangan milliy ma'lumotlardan ajratib ko'rsatish imkoniyatining mavjud emasligi. Empirik natijalar joylashirish (accommodation) sohasida energiya intensivligining yuqori darajada ekanligini (4,85%) va ayniqsa san'at, ko'ngilochar faoliyat hamda dam olish sohalarida (5,66%) yanada yuqori ko'rsatkichlarni namoyon etishini ko'rsatadi. Bunda elektr energiyasiga yuqori darajadagi qaramlik kuzatilib, bu transportdan tashqari yashirin resurs bosimlari mavjudligini anglatadi. Tadqiqot turizm qiymat zanjiri doirasida tarkibiy samarasizliklar va "taqsimlangan ekologik mas'uliyat" fenomenini aniqlaydi. Amaliy jihatdan, ma'muriy islohotlar, E-mehmon platformasi orqali raqamli integratsiya va iqtisodiy rag'batlantirish mexanizmlariga asoslangan bosqichma-bosqich joriy etish yo'l xaritasi taklif etiladi. Xulosa qismida ta'kidlanishicha, MST doirasining joriy etilmasligi sharoitida turizmning o'sishi nazorat qilinmagan ekologik xarajatlarning yuzaga kelish xavfini oshiradi va bu uzoq muddatli barqarorlikka putur yetkazadi.

The tourism sector of Uzbekistan is undergoing a period of unprecedented transformation. The policy of openness and the liberalization of the visa regime have led to a substantial increase in key performance indicators: according to preliminary data from the National Statistics Committee, the country welcomed 11.7 million foreign visitors by the end of 2025 [5]. For a double-landlocked country, tourism has emerged as a strategic driver of service exports and economic diversification. However, behind these impressive figures lies a critical challenge that remains largely outside the scope of official reporting—namely, the growing pressure on natural capital.

Uzbekistan is situated in a region characterized by high water stress, while its energy system, predominantly dependent on hydrocarbons, is subject to seasonal shortages. Under these conditions, the rapid expansion of tourist flows inevitably intensifies competition for key resources—water, energy, and food—between the local population and the hospitality sector. These risks are acknowledged at the policy level, including in the Resolution of the President of the Republic of Uzbekistan No. 4477 of October 4, 2019, “*On Approval of the Strategy for the Transition of the Republic of Uzbekistan to a Green Economy*,” which articulates principles of resource efficiency and sustainability. Nevertheless, a fundamental paradox emerges, forming the core subject of this study.

Despite the presence of political commitment and the adoption of “green” development strategies, Uzbekistan’s national statistical system lacks the necessary instruments to measure the actual environmental footprint of tourism. Existing reporting frameworks focus primarily on economic indicators (e.g., number of arrivals, service exports in USD), while disregarding physical resource flows (such as water consumption by accommodation facilities, waste generation by tourists, and the carbon footprint associated with air transport). In the absence of accurate measurement, effective resource management is unattainable: while economic gains are visible, the environmental costs accumulated by the sector remain unaccounted for.

A global response to this challenge was the adoption of a new statistical standard by the United Nations Statistical Commission in 2024—*Measuring the Sustainability of Tourism (MST)* [8]. This framework, for the first time, integrates tourism statistics (Tourism Satellite Accounts—TSA) with environmental-economic accounting (System of Environmental-Economic Accounting—SEEA) within a unified methodological structure. Previously, the absence of a common analytical framework precluded a comprehensive assessment of tourism sustainability. It was not possible to determine whether tourism growth was genuinely beneficial when accompanied by the depletion of natural resources or the deterioration of local living conditions.

The development of the MST framework originated from the recognition of the need to integrate economic and environmental data to enable a more holistic evaluation of tourism impacts. The process was led by the Expert Group on Measuring the Sustainability of Tourism, established under the auspices of UN Tourism in collaboration with the United Nations Statistics Division. Over several years, the methodology underwent extensive validation through pilot implementations in multiple countries (including Austria, Mexico, and the Philippines), which tested its practical applicability. The culmination of this process was the formal adoption of the Statistical Framework for Measuring the Sustainability of Tourism (SF-MST) at the 55th session of the United Nations Statistical Commission in February–March 2024, thereby establishing it as a new global statistical standard [8].

The objective of this article is to assess the feasibility of implementing the MST framework in a context characterized by a significant scarcity of disaggregated data. The study seeks not only to identify existing statistical gaps but also to propose a methodological approach based on proxy indicators. The relevance of this research lies in the fact that Uzbekistan, similar to many developing economies, faces the risk of “unmeasured growth,” whereby the economic benefits of tourism expansion may be offset by increasing pressures on infrastructure and environmental degradation.

3. METHODOLOGY

3.1. Statistical Framework of the Study

The empirical foundation for assessing the capabilities of the proposed standard is derived from an analysis of pilot studies synthesized by the United Nations World Tourism Organization in the report “*Experiences from Pilot Studies in Measuring the Sustainability of Tourism*” [1]. Evidence from countries with diverse statistical systems demonstrates the high diagnostic capacity of the MST framework:

Italy: Identification of Structural Imbalances. The National Institute of Statistics (Istat) applied the SF-MST methodology to test the hypothesis of environmental neutrality in tourism. The integration of emission accounts with economic data revealed a substantial structural imbalance: while tourism contributes only 5.2% to GDP, it accounts for 16.4% of ozone precursor emissions and 15.5% of acidifying substances.

Further calculations showed that the generation of €1 billion in value added requires 188–210% higher emissions compared to the average across economic sectors, primarily due to the obsolescence of the transport fleet [1, p. 20].

Saudi Arabia: Modeling in Data-Scarce Contexts. Of particular relevance to Uzbekistan is the experience of Saudi Arabia, where the implementation of MST was undertaken in the absence of comprehensive environmental accounts. This constraint necessitated the application of modeling approaches for key sectors such as transport and accommodation. The analysis not only identified structural inefficiencies—namely, the dominance of private road transport and the high energy intensity of hotel infrastructure—but also enabled the derivation of a “marginal environmental cost” function for infrastructure planning. Estimates indicate that attracting an additional 1 million tourists requires an incremental supply of approximately 7 million liters of fuel, 53 million kWh of electricity, and 500,000 cubic meters of water [1, p. 36]. This demonstrates the transformation of MST from a retrospective accounting tool into a forward-looking instrument for destination management.

The methodological foundation of MST is based on a transition from isolated indicators toward an integrated accounting system. Rather than generating entirely new datasets, the standard establishes an “integration bridge” between two existing international statistical frameworks:

1. **Tourism Satellite Accounts (TSA)**, which capture economic dimensions of tourism (e.g., value added, investment), disaggregated by specific industries such as accommodation, transport, and food services.
2. **System of Environmental-Economic Accounting (SEEA)**, which records flows of natural resources and residuals in physical units (e.g., joules, tons, cubic meters).

The MST methodology integrates these systems to construct hybrid accounts, enabling a shift from absolute measures to relative efficiency metrics (intensity indicators). A central analytical tool within this framework is the development of **Physical Flow Accounts**, structured as matrices in which columns represent tourism-related economic activities (derived from TSA), and rows correspond to the consumption of natural resources (derived from SEEA).

Table 1.

Illustrative Matrix of Physical Flow Accounts in Tourism

Indicators (Accounts)	Accommodation and Food Service Activities	Passenger Transport	Other Tourism Industries	Total Economy
A. ECONOMIC BLOCK (TSA Data)				
1. Gross Value Added (GVA)	Monetary value	Monetary value	Monetary value	∑
2. Employment	Persons	Persons	Persons	∑
B. ENVIRONMENTAL BLOCK (SEEA Data)				
3. WATER RESOURCES				
3.1. Water abstraction from natural sources	m ³	m ³	m ³	m ³
3.2. Use of distributed water	m ³	m ³	m ³	m ³
4. ENERGY AND EMISSIONS				
4.1. Total energy consumption	TJ (terajoules)	TJ	TJ	TJ
— of which from renewable sources	TJ	TJ	TJ	TJ
4.2. Greenhouse gas emissions (CO ₂)	Tons	Tons	Tons	Tons
C. SUSTAINABILITY INDICATORS				
Intensity ratio (B / A)	m ³ per unit of GVA	Tons per unit of GVA	...	

Note: Compiled by the author on the basis of the SF-MST methodology (UNWTO, 2024).

The presented matrix (Table 1) illustrates the methodological algorithm of SF-MST, which is founded upon data integration. The calculation logic is constructed upon the intersection of three dimensions:

1. Columns:

In contrast to traditional statistics, which account for "tourism as a whole," the matrix distinguishes specific industries, such as "Accommodation activities" and "Passenger transport." This allows for the localization of the source of environmental pressure.

2. Physical Accounting (Rows B):

The rows in Block "B" record real physical flows (cubic meters of water, joules of energy) consumed by a specific industry, rather than financial expenditures on environmental protection. Data are derived from SEEA accounts and distributed according to the principle of attribution to the consumer.

3. Calculation of Intensity Coefficients (Row C):

The primary analytical instrument is the calculation of specific resource intensity. It is calculated using the following formula:

$$RI_{(i)} = \frac{PF_{(i)}}{GVA_{(i)}}$$

Where:

- RI (Resource Intensity) – intensity of resource use;
- PF (Physical Flow) – volume of physical consumption (Row B, e.g., 4.2 – Emissions);
- GVA (Gross Value Added) – gross value added of the industry (Row A.1).

To demonstrate the analytical capabilities of SF-MST, we present a model calculation of eco-efficiency indicators for the accommodation sector. Let us consider two reporting periods (t_0 и t_1). Assuming that, according to TSA data, the Gross Value Added (GVA) of the sector in the base period (t_0) amounted to 100 million conventional monetary units. Concurrently, according to emissions accounts (SEEA), the volume of greenhouse gas emissions by this sector amounted to 500 tons of CO_2 -equivalent.

Using the intensity formula, we obtain the baseline resource intensity value:

$$RI_{t_0} = \frac{500}{100} = \frac{5 \text{ tonns } CO_2}{1 \text{ million units.}}$$

This implies that in the base period, the resource intensity coefficient equals 5.00.

In the subsequent period (t_1), economic growth of the industry is observed: GVA increases to 120 million units (+20%). Meanwhile, due to the implementation of energy-saving technologies, the absolute volume of emissions remains at the previous level (500 tons). The calculation of the indicator for the second period demonstrates the following dynamics:

$$RI_{t_1} = \frac{500}{120} \approx \frac{4,17 \text{ tons } CO_2}{1 \text{ million units.}}$$

Interpretation of results: The decrease in the intensity coefficient from 5.00 to 4.17 indicates an improvement in the sector's carbon efficiency. This situation characterizes a process of relative decoupling: the economic return from tourism grows faster than the pressure on the environment. It is precisely this dynamic that serves as the target benchmark for sustainable development according to UN standards.

3.2. Specifics of Accounting for Environmental Flows

The SF-MST framework establishes rigorous accounting rules for different categories of resources, thereby eliminating the methodological deficiencies that characterized earlier approaches.

Water Resources.

The standard requires the disaggregation of data on water abstraction, distinguishing between self-supply (e.g., water drawn from hotel wells) and water supplied through municipal distribution systems. In conventional utility reporting, these volumes are often not separately identified, which results in a distorted representation of actual resource use. MST requires that this “shadow” water be incorporated into a transparent accounting framework [8, p. 151]. This is particularly important for arid regions, as it makes it possible to identify the hidden pressure exerted by the tourism sector on local water resources.

A second crucial element concerns wastewater accounting. According to the logic of the SF-MST framework, it is insufficient merely to know how much water a hotel has consumed; it is equally important to determine how much water is returned and in what condition. The standard introduces the accounting of return flows with mandatory differentiation according to whether the water has been treated or discharged untreated [8, p. 86]. This level of detail makes it possible to calculate net water consumption. Relying on the SEEA balance method, which underpins the SF-MST framework, the net water consumption indicator may be defined as the difference between total water use and the volume of return flows [6, p. 110]:

$$\begin{aligned} & \textit{Net Consumption} \\ & = (\textit{Water abstraction} + \textit{Distributed water}) - \textit{Return Flows} \end{aligned}$$

This fundamentally alters efficiency assessment. A large hotel complex may consume a significant amount of water, but if it operates modern treatment facilities and returns 90% of the water to the ecosystem in a clean state, its actual environmental footprint may be smaller than that of a small guesthouse that discharges everything into a cesspool. For our arid regions, this represents the most equitable method of assessment.

Energy and Greenhouse Gas (GHG) Emissions.

Within the accounting framework for energy and GHG emissions, the SF-MST methodology addresses one of the most persistent challenges in tourism statistics—namely, the allocation of transport-related emissions.

Residence Principle versus Territorial Principle.

A fundamental distinction arises between these two accounting approaches. Conventional statistical reporting is based on the territorial principle, whereby emissions are attributed to the geographic location in which they physically occur. For example, if an aircraft flies over the territory of Country A, the associated emissions are assigned to that country.

In contrast, the MST framework adopts the residence principle, consistent with the System of Environmental-Economic Accounting (SEEA). Under this approach, emissions are attributed to the country of residence of the economic entity responsible for generating them. The underlying logic is that if the economic benefits from a flight accrue to an airline resident in Country B (and are thus reflected in its GDP), then the corresponding environmental impacts must also be recorded in Country B’s accounts, regardless of the physical location of the aircraft at the time of emission [8, p. 182].

This approach ensures consistency between the numerator (emissions) and the denominator (economic output). In the absence of such alignment, a conceptual inconsistency arises: revenues from international transport are recorded domestically, while the associated environmental impacts remain unaccounted for due to their occurrence outside national territory. The MST framework resolves this issue through the application of so-called “bridge tables,” which facilitate the reallocation of emissions. Specifically, emissions generated by non-resident transport operators within the national territory are excluded, while emissions generated by resident operators abroad are incorporated into national accounts.

B) Energy Source Composition.

A second critical aspect of the MST framework is the rejection of aggregated energy reporting based solely on total consumption (e.g., kilowatt-hours). Instead, the standard requires the disclosure of the structure of energy consumption by source. It is not sufficient to report that a hotel consumes a given quantity of electricity; it is essential to identify the origin of that energy.

Accordingly, MST classifies energy sources into fossil fuels (e.g., coal, natural gas, diesel) and renewable sources (e.g., solar, wind, hydropower). This disaggregation enhances analytical transparency and exposes instances of so-called “greenwashing.” For example, improvements in energy efficiency at the facility level may not correspond to genuine sustainability gains if the electricity consumed is generated from carbon-intensive sources. The implementation of this accounting framework therefore incentivizes not only reductions in energy consumption but also a structural transition toward low-carbon energy systems.

Solid Waste: The “Common Bin” Challenge.

The estimation of solid waste volumes presents significantly greater methodological complexity, as precise physical measurement is often infeasible. Unlike water and electricity, which can be monitored through metering systems, tourist-generated waste is frequently disposed of in shared municipal containers, where it becomes indistinguishable from household waste produced by local residents.

A) Attribution Method.

To address this limitation, the MST framework proposes the use of model-based estimation techniques grounded in waste generation coefficients. The procedure involves determining the average quantity of waste generated per tourist per day (e.g., kilograms per tourist-day) through sampling, and subsequently multiplying this coefficient by the total number of guest nights. The standard emphasizes the necessity of differentiating coefficients across accommodation types, reflecting variations in consumption patterns. For instance, tourists staying in five-star “all-inclusive” hotels typically generate significantly higher volumes of plastic and food waste than budget travelers in hostels.

B) Waste Treatment Pathways.

Beyond quantifying waste generation, the MST framework requires the tracking of waste treatment and disposal outcomes. Accounting systems must specify the proportion of waste directed to recycling, incineration, or landfill. This enables a more comprehensive assessment of environmental impacts and resource management efficiency.

From the perspective of municipal governance, the implementation of this methodology provides a robust analytical basis for fiscal regulation. In practice, conflicts frequently arise between local authorities and tourism enterprises regarding responsibility for waste management. While hospitality businesses may fulfill their obligations by financing on-site waste collection, a substantial share of so-called “diffuse waste” (e.g., takeaway packaging, plastic bottles) is generated by tourists in public spaces such as parks, squares, and pedestrian areas.

The application of MST-based attribution models allows this issue to be quantified. Local administrations can estimate the proportion of municipal solid waste attributable to tourism activity, as distinct from resident populations. This provides a sound economic justification for incorporating waste management costs into tourism-related fiscal instruments (e.g., tourism taxes or levies), thereby ensuring that such costs are borne by the actual consumers of tourism-related services.

3.3. Adaptation of Methodology to Uzbekistan’s Context

The implementation of the full MST framework in the context of a developing economy is constrained by the problem of data fragmentation. In response, an adaptive methodological approach based on the concept of “**stepwise data reconstruction**” was developed. Rather than attempting to populate the entire MST framework simultaneously, the approach prioritizes domains where validation is feasible through publicly available government data.

The research design comprised two sequential stages:

Stage 1. Audit of Statistical Gaps (Gap Analysis).

At the first stage, a diagnostic assessment of national statistical reporting was conducted to evaluate its compliance with the requirements of the MST standard. The empirical basis consisted of official reporting forms published by the State Committee on Statistics and accessible via the national Open Data Portal, including:

- Annual report “*Environmental Pollution*” (atmospheric emissions) [3];
- Annual report “*Protected Natural Areas*” [4].

The methodological objective of this stage was to identify so-called “blind spots,” defined as areas where data aggregation at the regional or municipal level prevents the isolation of tourism-specific impacts.

Stage 2. Calculation of Proxy Indicators (Energy Intensity Estimation).

At the second stage, in order to address the existing “information vacuum,” a proxy-based estimation approach was applied. The primary data source was the statistical bulletin “*Energy Efficiency Indicators of the Republic of Uzbekistan by Economic Activity for 2024*” [2].

Data were extracted in accordance with **NACE Rev. 2** classification codes corresponding to tourism-related activities:

- Code 55 – Accommodation;
- Code 56 – Food and beverage service activities;
- Code 51 – Air transport.

The principal analytical instrument was the **energy intensity index**, defined as the ratio of energy consumption to the sector’s Gross Value Added (GVA). The indicators calculated for tourism-related sectors were compared with the weighted average for the national economy (denoted as “Total”) in order to test the hypothesis of relatively higher resource intensity in the hospitality and tourism industries.

4. RESULTS

4.1. Identification of Statistical Gaps

The analysis of national statistical reporting revealed a substantial discrepancy between the currently available data and the requirements of the MST framework. The results of the audit are summarized in Table 2.

Table 2.

Gap Analysis of Environmental Statistics on Tourism in Uzbekistan.

Environmental Domain (according to MST)	Indicator in Uzbekistan’s Statistics	Gap Status
Atmospheric emissions (GHG emissions)	Total emissions for Uzbekistan: 866.7 thousand tons in 2024	Critical. It is impossible to isolate emissions generated by tourist transport and hotel boiler systems from industrial and municipal emissions.
Water resources (water use)	Share of population with access to safe water (%)	Absent. No accounting of water consumption in cubic meters is available. There are also no data on water use associated with swimming pools.
Biodiversity	Total area of protected territories: 5,355.6 thousand ha in 2024	Substantial. Data on the total area of protected territories are available, but information on recreational pressure (e.g., visitors per hectare) is entirely absent.

Thus, the current statistical system makes it possible to monitor the general state of the environment, but it does not allow for the identification and measurement of the specific impact of tourism activities.

4.2. The Energy Intensity Paradox

The analysis of energy efficiency data for 2024 yielded the first quantitative estimates of resource intensity across tourism-related sectors [2]. The results of the calculations, presented in Table 3, reveal a troubling pattern.

Table 3.

Structure of Energy Consumption in Tourism-Related Sectors in Uzbekistan (2024)

Sector (NACE Code)	*Energy Intensity Index (%) **	Share of Electricity (%)	Share of Fuel (%)
Total economy (average)	4.15	53.2	41.0
55. Accommodation	4.85	81.8	12.0
56. Food and beverage service activities	5.66	80.8	6.1
51. Air transport	26.95	0.0	99.9
79. Travel agency and tour operator activities	0.49	31.7	66.4
93. Arts, entertainment, and recreation	5.66	91.9	6.1

Note: The Energy Intensity Index reflects the share of energy costs in total production costs. A higher value indicates lower energy efficiency.

The obtained data reveal three fundamental problems.

1. The phenomenon of “hidden energy intensity” in recreation.

The most unexpected result concerns the arts, entertainment, and recreation sector (Code 93), which includes cultural parks, ski resorts, water parks, and museums. The energy intensity index for this sector amounted to 5.66%, exceeding not only the economy-wide average (4.15%) but also the corresponding indicator for the accommodation sector (4.85%). This suggests that the contemporary leisure industry in Uzbekistan is highly energy-intensive. Its critical dependence on electricity (91.9%) indicates that the operation of ski lifts, water filtration systems in water parks, and climate-control equipment in entertainment facilities generates peak loads on the unified power system, particularly during the summer and winter seasons.

2. Infrastructural inefficiency of accommodation.

The accommodation sector (Code 55) demonstrates an energy intensity index of 4.85%. Its excess over the economy-wide average confirms the hypothesis regarding the low energy efficiency of the hotel building stock. Under conditions of a sharply continental climate, a substantial share of energy consumption is associated with cooling in summer and heating in winter. The high share of electricity in total energy consumption (81.8%), combined with the predominance of thermal generation in the national energy mix, primarily based on natural-gas-fired thermal power plants, implies that the hotel sector constitutes a significant indirect source of greenhouse gas emissions, even in the absence of autonomous boiler systems.

3. Polarity within the tourism value chain.

A fundamental asymmetry emerges between the “architects” of travel demand and the direct providers of tourism services. The tour operators sector (Code 79) exhibits minimal energy intensity (0.49%), which is consistent with the office-based nature of its activities. However, this sector is precisely the one that generates demand for the services of the most environmentally intensive segment—air transport (Code 51), whose energy intensity index reaches an extreme 26.95% and is characterized by an almost complete dependence on fossil fuels (99.9%). This creates a situation of distributed environmental responsibility, in which tour operators market a product whose environmental costs are borne by adjacent sectors, particularly transport and recreation, while these externalities remain absent from their own sectoral reporting.

5. DISCUSSION

This section provides an interpretation of the empirical findings and proposes a roadmap for the integration of the MST framework into the national statistical system.

5.1. Drivers of High Resource Intensity

The identified phenomenon of elevated energy intensity in the entertainment sector (5.66%) and the accommodation sector (4.85%) is structurally determined.

In contrast to European Union countries, where the implementation of MST has occurred in parallel with broader energy transition processes, the development of tourism infrastructure in Uzbekistan is taking place under conditions of relatively low-cost energy resources. The high dependence of parks and recreational facilities on electricity (91.9%) indicates that “green tourism” currently remains largely declarative and is not yet supported by the widespread adoption of energy-efficient technologies.

5.2. Data Integration Roadmap

Based on the conducted gap analysis, a three-tier model for the implementation of the MST framework in Uzbekistan is proposed:

Step 1. Modernization of Environmental Reporting (Administrative Level).

The primary constraint lies in the high degree of data aggregation in existing reporting systems. It is proposed to revise the classification structure of environmental reporting forms by introducing a mandatory NACE code field for each emission source.

Expected outcome: This measure will enable the automatic identification and isolation of emissions generated by tourism-related activities (e.g., NACE codes 55 – Accommodation, and 93 – Arts, entertainment, and recreation), thereby separating them from industrial sources without requiring additional data collection.

Step 2. Digital Integration via the E-mehmon Platform (Digital Level).

Uzbekistan possesses a unique institutional advantage in the form of a centralized digital system for tourist registration–E-mehmon. It is proposed to integrate a “Hotel Eco-Passport” module into this platform. Mechanism: As part of licensing or certification procedures, accommodation facilities (hotels, hostels) would be required to report annual data on water and energy consumption within the system. Expected outcome: The platform would automatically normalize these data by the number of registered guest nights, thereby generating real-time MST indicators (e.g., liters of water per tourist). This directly addresses the absence of disaggregated water-use data identified in the Results section.

Step 3. Benchmarking and Green Incentives (Economic Level).

Using the average energy intensity index for the accommodation sector (4.85%) as a baseline, the state may introduce differentiated fiscal instruments to incentivize efficiency improvements. Proposal: Accommodation facilities with an energy intensity index below 4.0% (indicating relatively high efficiency) could be granted property tax reductions. Conversely, facilities with an index exceeding 6.0% (as observed in high-intensity segments such as recreation) should be subject to mandatory energy audits.

5.3. Study Limitations

It is important to acknowledge the limitations of the present analysis, which is based on proxy indicators. The use of sectoral averages may obscure heterogeneity within the sector, particularly differences between newly constructed, energy-efficient facilities and older, less efficient building stock. Future research should prioritize the collection of primary data through field-based studies in pilot regions, such as Bukhara or Samarkand, to enhance the accuracy and granularity of the analysis.

6. CONCLUSION

This study provides the first comprehensive assessment of the readiness of Uzbekistan’s national statistical system to implement the United Nations statistical framework *Measuring the Sustainability of Tourism* (MST). The findings demonstrate that the current model of statistical observation remains insufficient for capturing the environmental dimensions of tourism development and, as a consequence, produces a condition of statistical invisibility with respect to the ecological costs of tourism growth.

Several principal conclusions emerge from the analysis.

First, a significant institutional and statistical gap persists within the existing reporting architecture. Environmental data in Uzbekistan are recorded predominantly at an aggregated territorial level, which makes it impossible to distinguish the specific contribution of tourism-related activities from that of other sectors. As the gap analysis has shown, although official statistics provide aggregate data on emissions, protected areas, and selected environmental indicators, they do not allow for the identification of tourism’s direct environmental footprint.

In the absence of such disaggregation, neither evidence-based regulation nor effective sustainability management is possible.

Second, the study reveals the presence of hidden resource pressures within tourism value chains. The proxy-based calculations demonstrate that environmental pressure is not limited to transport alone. On the contrary, the sectors of accommodation, recreation, and entertainment exhibit substantial energy intensity and a pronounced dependence on electricity. Particularly notable is the finding that the arts, entertainment, and recreation sector displays an energy intensity level exceeding that of accommodation services, thereby indicating that leisure infrastructure itself constitutes an important source of environmental burden. This finding is of particular significance for Uzbekistan, where tourism expansion increasingly relies on energy-intensive recreational complexes operating under conditions of seasonal pressure on national infrastructure systems.

Third, the results confirm that the most realistic pathway toward MST implementation in Uzbekistan lies in targeted institutional adaptation rather than full-scale statistical replication of foreign models. Given the existing limitations of environmental accounting, the most effective strategy is not the immediate creation of an entirely new data system, but the gradual integration of environmental reporting modules into already functioning administrative and digital platforms, especially the *E-mehmon* system. Such an approach would make it possible to move from fragmented and episodic estimates toward a system of regular, operational, and policy-relevant monitoring of resource consumption in tourism.

Taken together, these findings suggest that the transition to sustainable tourism in Uzbekistan is not merely a question of expanding tourist flows or increasing export revenues from services. It is fundamentally a question of whether the state possesses the statistical capacity to identify, measure, and govern the environmental consequences of that growth. In this sense, MST should be viewed not simply as a technical accounting framework, but as a strategic governance instrument capable of linking tourism policy with water security, energy efficiency, and territorial sustainability.

Therefore, the central policy implication of this study is clear: without the incorporation of MST principles into the national statistical system, future growth in tourism will remain only partially visible to policymakers. Economic gains may continue to be recorded, while environmental costs accumulate outside the field of observation. Under such conditions, tourism growth risks becoming quantitatively impressive but qualitatively unsustainable. The implementation of MST is thus not only a matter of statistical modernization, but also a necessary precondition for ensuring that tourism development in Uzbekistan is economically beneficial, environmentally responsible, and institutionally manageable in the long term.

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SCIENTIFIC REVIEW

The submitted article, *“Implementing the UN Statistical Standard MST in Uzbekistan: Data Gap Analysis and Integration Pathways,”* addresses a highly pertinent and methodologically complex issue concerning the integration of environmental and tourism statistics within the national context of Uzbekistan. The authors aim to evaluate the feasibility of implementing the United Nations Measuring the Sustainability of Tourism (MST) framework under conditions of significant data limitations, which positions the study at the intersection of statistical methodology, environmental economics, and tourism policy. The article demonstrates a notable degree of scientific originality. Its principal contribution lies in the contextual adaptation of the MST framework to a data-constrained developing economy. The introduction of the concept of “statistical blindness” provides a useful analytical lens for diagnosing systemic deficiencies in national statistical systems. Furthermore, the application of proxy-based estimation techniques to approximate energy intensity represents an innovative methodological response to the absence of disaggregated environmental data. The identification of the “energy intensity paradox,” wherein the recreation sector exceeds accommodation in resource intensity, constitutes an original empirical insight that challenges conventional assumptions about tourism-related environmental pressures. The relevance of the study is beyond dispute. Uzbekistan’s rapidly expanding tourism sector, coupled with increasing stress on water and energy resources, necessitates the development of robust measurement tools for environmental sustainability. The article aligns closely with global policy agendas, including the Sustainable Development Goals and the transition toward green economies. Importantly, it addresses a critical policy gap: while economic indicators of tourism performance are well established, environmental externalities remain largely unquantified. This imbalance underscores the urgency of adopting integrated statistical frameworks such as MST.

The practical implications of the research are substantial. The authors propose a coherent and actionable roadmap for MST implementation, structured across administrative, digital, and economic dimensions. The recommendation to integrate an eco-accounting module into the national E-mehmon platform is particularly noteworthy, as it leverages existing digital infrastructure to facilitate real-time monitoring. Additionally, the proposed use of energy intensity benchmarks as a basis for fiscal incentives introduces a tangible mechanism for promoting resource efficiency within the tourism sector. These proposals enhance the policy relevance and applicability of the study.

Methodologically, the study is well-grounded in internationally recognized frameworks, notably the integration of Tourism Satellite Accounts (TSA) and the System of Environmental-Economic Accounting (SEEA). The two-stage approach—comprising gap analysis and proxy-based estimation—is logically structured and appropriate given the constraints of available data. Notwithstanding its merits, the article exhibits certain limitations. The empirical analysis remains constrained by indirect estimation methods, which may affect the accuracy of conclusions. Additionally, the absence of regional disaggregation limits the ability to capture spatial variations in tourism impacts. Some conceptual constructs, such as “distributed environmental responsibility,” could be further elaborated and theoretically substantiated.

In conclusion, the article represents a significant and timely contribution to the literature on sustainable tourism measurement and statistical system reform. Despite minor methodological limitations, its scientific rigor, originality, and practical relevance are evident. The identified shortcomings do not detract substantially from its overall quality. Accordingly, the article is recommended for publication in a peer-reviewed scientific journal, subject to minor revisions aimed at clarifying methodological assumptions and strengthening the conceptual framework.

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