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Article

Developing Ecological Tourism as a Driver of the Green Economy in Arid Regions: A Case Study of the Aral Sea Region

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Abstract: The transition to a green economy - an economy that is low-carbon, resource-efficient and socially inclusive - has become a central organising principle for development in environmentally stressed regions. The Aral Sea region of Uzbekistan, and in particular the autonomous Republic of Karakalpakstan, exemplifies the challenge of reconciling economic recovery with severe ecological degradation following one of the twentieth century's largest human-induced environmental disasters. This article examines the mechanisms through which ecological tourism (ecotourism) can act as a driver of the green economy in this arid, degraded setting. Drawing on national policy documents, reports of the World Tourism Organization (UN Tourism), the World Economic Forum and the United Nations Development Programme, peer-reviewed literature, and secondary statistical data, the study adopts a qualitative case-study design to map the region's tourism assets, the enabling policy environment, and the institutional and financial mechanisms needed to convert natural and cultural capital into green growth. The results show that Karakalpakstan possesses distinctive ecotourism assets - the Aralkum desert and the Moynaq ship graveyard, desert and wetland ecosystems, and a rich Karakalpak cultural heritage - and benefits from a strong policy tailwind, including Uzbekistan's Strategy for the Transition to a Green Economy (2019-2030) and the 2021 United Nations resolution declaring the region a zone of ecological innovations and technologies. Realising this potential, however, depends on coordinated mechanisms spanning spatial planning, green finance and microcredit, community capacity-building, low-carbon infrastructure, marketing and inclusive governance. The article proposes an integrated conceptual framework linking these mechanisms to environmental, economic and social outcomes, and discusses the principal barriers - infrastructure deficits, limited managerial capacity, seasonality and ecological fragility - together with the policy implications for sustainable regional development.

Keywords: green economy; ecological tourism; arid regions; Aral Sea; Karakalpakstan; sustainable development; Uzbekistan; regional diversification

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1. Introduction

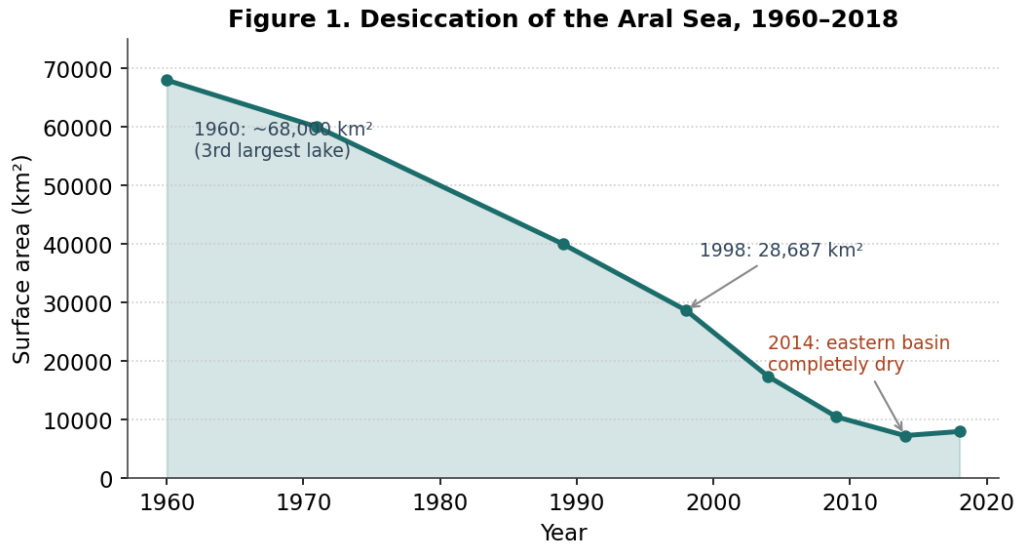
The concept of the green economy has moved from the margins of environmental policy to the centre of mainstream development thinking. The United Nations Environment Programme (UNEP) defines a green economy as one that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities; in operational terms it is described as low-

carbon, resource-efficient and socially inclusive [1]. In such an economy, growth in employment and income is driven by public and private investment that reduces emissions and pollution, enhances energy and resource efficiency, and prevents the loss of biodiversity and ecosystem services [1]. Tourism occupies a prominent place in this agenda. In the background report prepared jointly by the World Tourism Organization (UN Tourism) and UNEP, tourism was identified as one of ten economic sectors best able to catalyse a transition toward a sustainable and inclusive green economy, on the condition that investment is redirected toward greener infrastructure, energy and water efficiency, biodiversity conservation and local employment [2].

Two features make tourism an especially attractive candidate for green-economy strategies in lagging regions. First, it is a service sector with a relatively light physical footprint: well-managed tourism consumes far less water and land per unit of value added than irrigated agriculture or extractive industry, and much of its capital stock - heritage sites, landscapes and cultural practices - is non-depletable if properly stewarded. Second, its value chains are unusually broad and shallow, reaching into transport, food, crafts, construction and personal services, so that a single visitor's expenditure can be distributed across many small, locally owned enterprises. These characteristics help explain why nature-based and ecological tourism have grown faster than tourism as a whole in recent decades, and why international organisations consistently identify the sector as a vehicle for inclusive, low-carbon growth [2]. They also explain its appeal in places where the conventional resource base has been exhausted or destroyed [3][4].

For arid and degraded regions, the green-economy framing is particularly compelling. Drylands face acute structural constraints - chronic water scarcity, soil salinisation, land degradation and fragile ecosystems - that limit the scope of conventional, resource-intensive growth. Yet many such regions hold distinctive natural and cultural assets: dramatic desert landscapes, endemic biodiversity, geological and palaeo-environmental features, and living cultural traditions adapted to scarcity [5][6][7]. Where these assets can be mobilised responsibly, tourism - and ecological tourism in particular - offers a path to economic diversification that is comparatively land- and water-light, labour-intensive and capable of channelling value to local communities. Ecotourism, understood as responsible travel to natural areas that conserves the environment, sustains the well-being of local people and involves interpretation and education, is therefore frequently proposed as a green-economy instrument for marginal regions [8].

No region illustrates the tension between ecological catastrophe and developmental aspiration more starkly than the Aral Sea basin. In 1960 the Aral Sea was among the largest inland bodies of water on Earth, with a surface area of roughly 68,000 square kilometres [9], [10]. The diversion of its two feeding rivers, the Amu Darya and the Syr Darya, for large-scale cotton irrigation during the Soviet period triggered a sustained decline: by 1998 the sea had contracted to about 28,687 square kilometres, and in 2014 satellite observation confirmed that the eastern basin had dried completely for the first time in modern history (Figure 1) [9]. The exposed seabed has become the Aralkum, a young salt desert covering several million hectares. Every year, vast quantities of salt, fine sediment and agrochemical residues - on the order of a hundred million tonnes - are lifted from this surface by wind and deposited across the surrounding region, intensifying dust storms and degrading air, soil and water quality. The human consequences in Karakalpakstan have been severe, including elevated rates of respiratory and other illnesses, the collapse of the once-substantial fishing economy, unemployment and out-migration.



Source: compiled from NASA Earth Observatory and Encyclopaedia Britannica (values approximate).

The policy response has been correspondingly ambitious. In May 2021 the United Nations General Assembly unanimously adopted a special resolution, co-sponsored by some sixty states, declaring the Aral Sea region a zone of ecological innovations and technologies, and calling on member states, United Nations entities and international financial institutions to deploy environmentally sound, energy- and water-saving technologies in line with the 2030 Agenda for Sustainable Development [7]. At the national level, Uzbekistan adopted a Strategy for the Transition to a Green Economy for the period 2019-2030, later reinforced within the overarching Uzbekistan-2030 Strategy, setting targets for renewable energy, energy efficiency, emissions intensity and large-scale afforestation [6]. Tourism has simultaneously been elevated to a national development priority, and international partners - most visibly the United Nations Development Programme (UNDP) together with bilateral agencies - have begun to support sustainable ecotourism specifically in Karakalpakstan [8]. These converging agendas raise the practical question this article addresses: through what concrete mechanisms can ecological tourism convert the region's degraded but distinctive landscapes into a driver of the green economy?

The aim of this study is therefore to identify, organise and critically assess the mechanisms by which ecotourism can contribute to green-economy outcomes in the arid Aral Sea region, using Karakalpakstan as a case study. Three research questions guide the analysis. First, what is the policy and economic context that frames green tourism development in the region? Second, what natural and cultural assets provide the resource base for ecotourism, and how ready are local stakeholders to mobilise them? Third, what institutional, financial and governance mechanisms are required to link these assets to durable environmental, economic and social outcomes? The contribution of the article is to synthesise dispersed evidence - from international agency reporting, national strategy and a small but growing scholarly literature - into an integrated conceptual framework that is transferable to other degraded drylands. The remainder of the paper follows the IMRAD format: the next section describes the study area and methods; Section 3 presents results on policy, assets, mechanisms and stakeholder readiness; Section 4 discusses interpretation, barriers and policy implications; and Section 5 concludes.

2. Materials and Methods

2.1. Study area

The Republic of Karakalpakstan is an autonomous republic occupying the north-western part of Uzbekistan and covering approximately 166,600 square kilometres -

about 37 per cent of the national territory - yet home to under two million inhabitants, making it one of the most sparsely populated parts of the country. Its capital is Nukus, while the former fishing port of Moynaq, once on the southern shore of the Aral Sea, now lies tens of kilometres from any open water. The climate is sharply continental and arid, with hot, dry summers, cold winters, very low precipitation and high evaporation; the landscape is dominated by the Kyzylkum and Aralkum deserts, the Ustyurt Plateau, the Amu Darya delta and a network of residual lakes and wetlands. Karakalpakstan sits at the epicentre of the Aral Sea crisis and consequently combines exceptional environmental stress with an equally exceptional concentration of features - ecological, geological and cultural - of potential interest to responsible visitors.

This combination makes the republic an instructive critical case. It is severe enough to test whether tourism can contribute to recovery under genuinely adverse conditions, yet sufficiently endowed with distinctive assets and policy attention that a credible development pathway exists. Findings drawn from Karakalpakstan are therefore relevant to a wider class of degraded arid regions seeking to diversify away from declining primary sectors.

2.2. Research design and data sources

The study adopts a qualitative, single-case design appropriate to an exploratory, mechanism-oriented research question. Rather than testing a pre-specified hypothesis, it integrates multiple strands of secondary evidence to build and illustrate a conceptual framework. Three categories of source material were used. The first comprises policy and institutional documents, including Uzbekistan's Strategy for the Transition to a Green Economy (Resolution PP-4477) and the Uzbekistan-2030 Strategy [6], the 2021 United Nations General Assembly resolution on the Aral Sea region [7], and programme documentation and press materials from UNDP Uzbekistan concerning ecotourism and green development in Karakalpakstan [8]. The second comprises international benchmarking and thematic reports, notably the UN Tourism-UNEP report on tourism in the green economy [2], UNEP's foundational green-economy report [1], and the World Economic Forum's Travel & Tourism Development Index 2024 [3], [13]. The third comprises peer-reviewed scholarship on the region, in particular the supply-side study of ecotourism readiness among Uzbek tour operators by Saidmamatov and colleagues [4] and the systematic review of nature-based solutions in the Aral Sea drylands by Alikhanova and Bull [5].

Secondary quantitative indicators - international tourist arrivals, tourism-service exports and the physical contraction of the sea - were compiled from the World Bank's World Development Indicators [11], the National Statistics Committee of the Republic of Uzbekistan [12], and Earth-observation and reference sources for the sea's surface area [9], [10]. These data are used descriptively, to characterise trends rather than to support causal inference. Analytically, the material was examined through qualitative content analysis: documents were read to extract recurring themes relating to assets, instruments, actors and outcomes, which were then organised into the mechanism categories presented in Section 3.4 and synthesised into the conceptual framework of Figure 3. The approach has limitations common to secondary, single-case research - reliance on the completeness and accuracy of published sources, the absence of primary fieldwork, and limited statistical generalisability - which are discussed in Section 4.4. To mitigate these, claims were cross-checked across independent sources wherever possible, and quantitative figures are reported as approximate where primary series are incomplete.

3. Results

3.1. The green-economy policy framework in Uzbekistan

Uzbekistan's green-economy agenda provides the institutional scaffolding within which tourism development in the Aral Sea region must be understood. The Strategy for the Transition to a Green Economy for 2019-2030, approved by presidential resolution

PP-4477 and subsequently strengthened, sets out objectives spanning energy efficiency, the rational use and conservation of natural resources, the reduction of greenhouse-gas emissions, expanded access to clean energy, the creation of green jobs and improved climate resilience [6]. Within the Uzbekistan-2030 Strategy these ambitions are expressed through quantified targets, including a substantial increase in renewable-generation capacity and its share of consumption, a reduction in the emissions intensity of gross domestic product relative to a 2010 baseline, and very large-scale tree planting [6]. Although these targets are national in scope, their logic - decoupling welfare gains from environmental pressure - maps directly onto the needs of the Aral Sea region, where any development model must be water-light, low-carbon and restorative rather than extractive.

The 2021 United Nations resolution adds an international dimension by designating the Aral Sea region a zone of ecological innovations and technologies, encouraging research and scientific activity to recover the environment, conserve natural resources and improve quality of life, and inviting partners to channel green technologies and finance into the region through mechanisms such as the Multi-Partner Human Security Trust Fund for the Aral Sea region [7]. Taken together, the national strategy and the international resolution constitute an unusually favourable enabling environment: they legitimise green investment, attract concessional finance and signal political commitment, all of which are preconditions for the kind of patient, mission-oriented development that responsible tourism requires. Table 1 summarises the principal components of the green economy and their specific linkages to ecotourism in the Aral Sea setting.

Table 1. Components of the green economy and their linkages to ecotourism in the Aral Sea region.

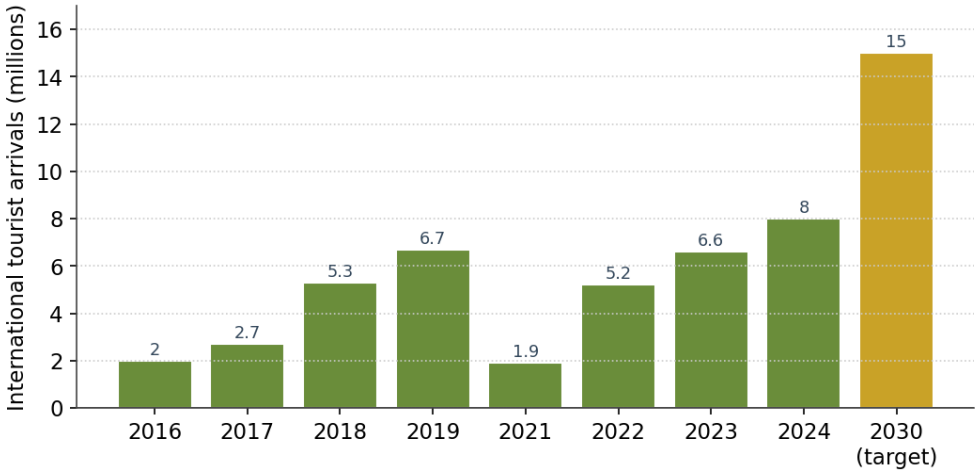
Green-economy component	**Operational meaning**	**Ecotourism linkage in the Aral Sea region**
Low-carbon	Activity that minimises fossil-fuel dependence and greenhouse-gas emissions	Solar-powered yurt camps and visitor facilities; low-emission transport; small footprint relative to heavy industry
Resource-efficient	More value from fewer material and water inputs; minimal waste	Tourism's low water intensity suits an arid region; reuse of existing settlements (Moynaq, Nukus) and heritage assets
Socially inclusive	A transition that does not leave vulnerable workers or communities behind	Community guiding, crafts and homestays distribute income locally and create alternatives to out-migration
Natural-capital protecting	Preventing biodiversity and ecosystem-service loss	Revenue and awareness support afforestation, wetland and saiga conservation; visitor fees can co-fund restoration

Source: authors' elaboration based on [1], [2], [4], [5].

3.2. The position of tourism in Uzbekistan's economy

Tourism has been one of the fastest-expanding sectors of the Uzbek economy. International arrivals rose from roughly two million in the mid-2010s to a pre-pandemic peak of about 6.7 million in 2019, before the COVID-19 shock; recovery was rapid thereafter, with arrivals reaching approximately 6.6 million in 2023 and around 8 million in 2024 [11], [12]. Tourism-service exports grew in parallel, exceeding three billion United States dollars in 2024. The Uzbekistan-2030 Strategy sets a target of 15 million foreign visitors and five billion dollars of tourism-service exports, implying continued double-digit growth [12]. Figure 2 depicts this trajectory and the 2030 target. The significance for Karakalpakstan is twofold: a rising national tourism tide creates spill-over demand for distinctive secondary destinations, and the strategic prioritisation of tourism unlocks budgetary and institutional support that peripheral regions can access.

Figure 2. Uzbekistan international tourist arrivals, 2016–2024, and the Uzbekistan-2030 target



Source: compiled from World Bank, National Statistics Committee of Uzbekistan, and Uzbekistan-2030 Strategy.

Uzbekistan's improving competitive position is corroborated by the World Economic Forum's Travel & Tourism Development Index 2024, which assesses 119 economies across pillars covering the enabling environment, policy conditions, infrastructure, demand drivers and sustainability. Uzbekistan recorded the largest improvement in score of any country between the 2019 and 2024 editions, advancing its score by 7.8 per cent and its rank from 94th to 78th - placing it second only to Saudi Arabia among the most-improved performers [3], [13]. While the index is national, gains in air connectivity, visa openness, prioritisation of travel and tourism, and tourism infrastructure all benefit a remote region such as Karakalpakstan, which depends on national gateways and policy frameworks for access. Table 3 summarises Uzbekistan's position in the index.

Access remains the practical hinge on which Karakalpakstan's prospects turn. The region is not a primary gateway; most international visitors enter Uzbekistan through Tashkent, Samarkand and the historic Silk Road cities, and reach the Aral Sea region as an extension of an established cultural circuit. Proximity to Khiva - designated the Tourism Capital of the Islamic World in 2024 - and the wider Khorezm cultural cluster offers a natural feeder market, since Nukus and Moynaq lie within reach of travellers already committed to north-western Uzbekistan. The strategic implication is that Karakalpakstan should be positioned less as a stand-alone long-haul destination than as a distinctive, high-value extension of the national circuit, marketed jointly with the established Silk Road itinerary while retaining its own ecological and cultural identity. This routing logic also shapes infrastructure priorities, concentrating early investment on the Nukus gateway and the Nukus-Moynaq corridor.

3.3. The ecotourism asset base of the Aral Sea region

Despite - indeed partly because of - its ecological trauma, the Aral Sea region possesses an unusually varied portfolio of tourism assets. These can be grouped into four categories: disaster and post-industrial landscapes, natural ecosystems and biodiversity, geological and scientific features, and living cultural heritage. The most internationally recognisable asset is the Moynaq ship graveyard, where rusting fishing vessels lie stranded on the former seabed; the site has evolved from a symbol of destruction into an open-air memorial and a focus of heritage and educational tourism, increasingly framed not as a spectacle of ruin but as a place to learn from environmental mistakes and to understand climate change [14][15]. Around Moynaq, the Aralkum desert itself, the dramatic Ustyurt Plateau escarpments, and the canyons of the western chink offer landscapes of considerable scenic and scientific value.

The region's surviving ecosystems are also significant. The Sudochie wetlands and other residual lakes in the Amu Darya delta support migratory birds and have been the focus of community ecotourism initiatives, including yurt camps and craft workshops developed with international support [1], [5]. The wider Ustyurt and Aral landscapes form part of the range of the critically endangered saiga antelope, whose conservation is increasingly linked to low-impact, community-based tourism and citizen engagement [16]. The cultural dimension is equally important: Nukus is home to the renowned Savitsky Museum, with one of the world's most important collections of Soviet-era avant-garde art; the Karakalpak people maintain distinctive traditions of yurt-making, carpet- and textile-craft, music and cuisine; and the desert hosts the Stihia electronic-music, art and science festival, held since 2017 near the Moynaq memorial, which deliberately couples cultural programming with scientific forums on the Aral crisis and draws thousands of attendees from Central Asia and beyond [17][18]. Higher-level convening, such as the Aral Culture Summit launched in 2025, signals an intent to position culture and creativity as engines of regional development [14]. Table 2 catalogues these assets and their tourism uses.

Table 2. Principal ecotourism assets of the Aral Sea region (Karakalpakstan).

Asset category	**Examples**	**Tourism use and green-economy relevance**
Disaster & post-industrial landscape	Moynaq ship graveyard; former seabed; abandoned port infrastructure	Heritage, educational and 'last-chance' tourism; interpretation of environmental change [15]
Natural ecosystems & biodiversity	Sudochie wetlands; Amu Darya delta; saiga antelope range; migratory birdlife	Birdwatching, wildlife and nature tourism; revenue linked to conservation [5], [16]
Geological & scientific features	Aralkum salt desert; Ustyurt Plateau escarpments; western chink canyons	Geotourism, scientific and research tourism; field stations and citizen science
Living cultural heritage	Savitsky Museum (Nukus); yurt-making and textile crafts; cuisine; Stihia festival	Cultural and creative tourism; community enterprises and crafts income [14], [18]

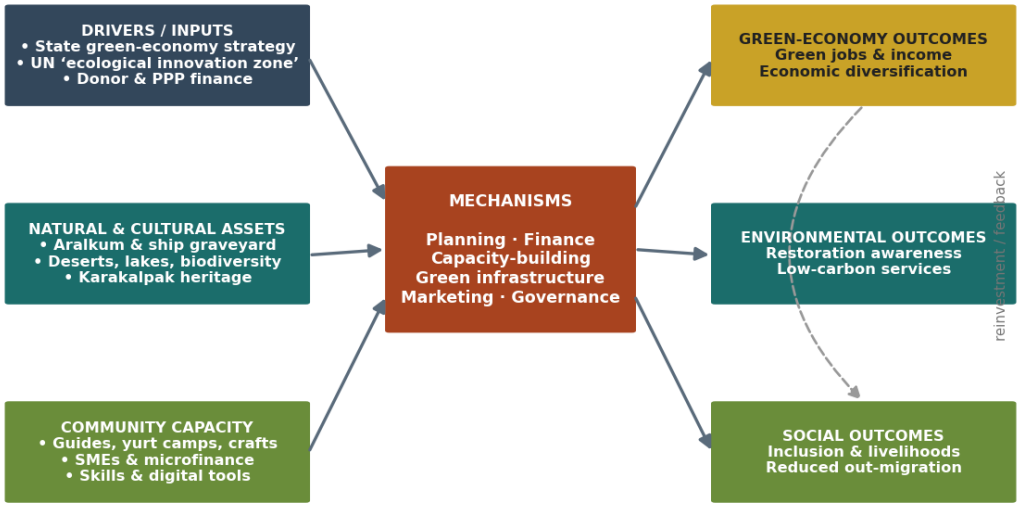
Source: authors' elaboration based on [5], [14], [15], [16], [18].

3.4. Mechanisms linking ecotourism to the green economy

The central analytical contribution of this study is to specify the mechanisms that convert the asset base described above into green-economy outcomes. Synthesis of the policy, agency and scholarly sources yields six interdependent mechanism categories,

presented in Figure 3 as an integrated conceptual framework and detailed in Table 4. The framework reads from left to right: drivers and inputs (policy commitment, donor and public-private finance, and the region's special international status) and the natural, cultural and community-capacity asset stocks feed into a set of mechanisms, which in turn generate environmental, economic and social outcomes; a feedback loop reinvests part of the value created back into assets and capacity.

Figure 3. Conceptual framework: ecotourism as a driver of the green economy in the Aral Sea region



Source: authors' own elaboration.

The first mechanism is **spatial planning and destination management**: zoning of fragile areas, designation and effective management of protected areas, carrying-capacity limits, and the integration of tourism into regional land- and water-use planning so that visitor flows do not aggravate degradation. The second is **green finance and microcredit**: blended and concessional finance, public-private partnerships, and accessible microcredit for small and medium-sized tourism enterprises, addressing what the supply-side literature identifies as one of the sector's most binding constraints [4]. The third is **capacity-building and skills**: training of guides, hospitality workers and enterprise managers, the transfer of digital marketing competence, and the strengthening of community organisations, again echoing documented gaps in experience, competence and international networks [4]. The fourth is **green infrastructure**: renewable-powered accommodation, water-efficient and waste-minimising facilities, and low-impact access and transport. The fifth is **marketing, branding and interpretation**: positioning the region around authentic ecological and cultural narratives, quality interpretation, and certification that protects against greenwashing. The sixth is **governance and partnership**: coordination across ministries, regional authorities, communities, the private sector and international partners, supported by monitoring and transparent benefit-sharing. Table 4 maps each mechanism to concrete instruments and to the green-economy contribution it is expected to make.

Table 4. Mechanisms linking ecotourism to the green economy, with instruments and expected contributions.

Mechanism	Illustrative instruments	Expected green-economy contribution
Spatial planning & destination management	Protected-area designation; zoning; carrying-capacity limits; land- and water-use integration	Protects natural capital; prevents over-tourism; aligns growth with restoration

Green finance & microcredit	Blended finance; PPPs; SME microcredit; donor co-financing [7]	Mobilises investment; lowers entry barriers; supports local enterprise [4]
Capacity-building & skills	Guide and hospitality training; digital-marketing transfer; community organisation [8]	Creates green jobs; raises productivity; retains value locally
Green infrastructure	Solar power; water-efficient, low-waste facilities; low-impact transport	Reduces emissions and resource use; demonstrates green technology [7]
Marketing, branding & interpretation	Destination branding; interpretation centres; eco-certification	Differentiates the destination; guards against greenwashing; educates visitors
Governance & partnership	Inter-agency coordination; community participation; monitoring and benefit-sharing	Ensures inclusivity and accountability; sustains social licence

Source: authors' elaboration based on [2], [4], [5], [7], [8].

Two cross-cutting accelerators reinforce these mechanisms. The first is digitalisation: online booking and payment, social-media storytelling, virtual and augmented interpretation of the lost sea, and open environmental data lower marketing costs, widen market reach and strengthen the educational mission, while demanding new digital competences from local enterprises [8]. The second is events and festivals, which can compress the slow work of destination-building into concentrated moments of visibility. The Stihia festival exemplifies this: by coupling cultural programming with a scientific forum on the Aral crisis, it generates international attention, seasonal demand and a narrative of regeneration, while testing the region's logistical capacity [18]. Events are not a substitute for steady capacity-building and infrastructure, but they can catalyse investment, build local confidence and create a recognisable brand around which the other mechanisms cohere.

3.5. Stakeholder readiness and constraints

Mechanisms operate only as well as the actors who implement them. The most directly relevant empirical evidence comes from the supply-side study by Saidmamatov and colleagues, who surveyed Uzbek travel agents and tour operators about ecotourism in the Aral Sea region [4]. Their central finding is a readiness paradox: stakeholders clearly recognise the value of ecotourism and are motivated to develop it, yet they report limited practical experience, constrained managerial competence and weak international networks, and they identify infrastructure development and access to microfinance as their greatest needs [4]. This pattern is consistent with the wider literature on tourism in developing drylands and directly informs the prioritisation of mechanisms: finance and capacity-building are not optional complements but preconditions for the rest. Table 3 situates these micro-level constraints within Uzbekistan's macro-level competitive trajectory.

Table 3. Uzbekistan in the World Economic Forum Travel & Tourism Development Index 2024.

Indicator	**Value (2024 edition)**
Economies assessed	119

Uzbekistan rank	78th
Rank in the 2019 edition	94th
Change in index score, 2019-2024	+7.8% (largest absolute score gain of any economy)
Standing among most-improved performers	2nd (after Saudi Arabia)
Index custodian / partner	World Economic Forum, with the University of Surrey

Source: compiled from [3], [13].

On the supply side, international and bilateral partners have begun to address these constraints. UNDP has supported the expansion of sustainable ecotourism in Karakalpakstan, while development agencies have piloted community ecotourism around the Sudochie wetlands, including yurt camps and craft workshops that build local guiding and enterprise capacity [8]. These initiatives remain modest in scale relative to the region's needs, but they demonstrate the practicability of the capacity-building and green-infrastructure mechanisms and provide replicable models. The results therefore indicate a region with a credible asset base and a supportive policy environment, but with implementation capacity that is still nascent and unevenly distributed.

4. Discussion

4.1. Ecotourism as a lever for green growth

The evidence assembled here supports a qualified affirmative answer to the study's guiding question: ecological tourism can act as a driver of the green economy in the arid Aral Sea region, provided the six mechanisms operate together rather than in isolation. The argument rests on a coherent causal logic. Tourism is comparatively water-light and low-carbon relative to the cotton-irrigation and heavy-industry models that historically dominated the basin, which aligns it with the resource-efficiency and low-carbon pillars of the green economy [1], [2]. It is labour-intensive and amenable to community ownership, which serves the social-inclusion pillar and offers an alternative to out-migration. And, crucially, it can internalise environmental value: where visitors come precisely to witness ecological change and restoration, the conservation of natural capital becomes an economic asset rather than a cost. In this sense ecotourism can help reframe the Aralkum from a purely negative externality into a managed, value-generating landscape - an interpretation reinforced by the region's emerging positioning as an educational and 'ecological-innovation' destination [7], [15].

A central promise of ecotourism in this setting is employment. The Aral disaster destroyed the region's economic base - above all the fishing and processing industries that had sustained towns such as Moynaq - leaving high unemployment, deep poverty and sustained out-migration in its wake [17]. Tourism cannot replace a sea, but it can generate a diversified portfolio of livelihoods that draws on assets the region still possesses: guiding, hospitality, transport, crafts, food and cultural production. Because these activities are labour-intensive and require modest capital, they are well suited to a young, underemployed population, and because they can be organised through community enterprises and cooperatives, they can retain a larger share of value locally. The employment case is therefore not incidental to the green-economy argument but central to it: the social-inclusion pillar is realised concretely through jobs, and the legitimacy of the whole strategy depends on those jobs reaching the people who bore the costs of the catastrophe [2], [17].

This reframing is consistent with the nature-based-solutions perspective advanced by Alikhanova and Bull, who argue that interventions such as afforestation, wetland rehabilitation and biodiversity protection in the Aral drylands can deliver simultaneous ecological and socio-economic benefits [5]. Tourism is best understood not as a stand-alone sector but as one component of an integrated green-development portfolio in which restoration, renewable energy, climate-smart agriculture and visitor services reinforce one another. The feedback loop in Figure 3 captures this: revenue and awareness generated by tourism can co-finance and sustain the very restoration that maintains the destination's appeal.

4.2. Barriers, risks and trade-offs

Several barriers temper this optimism. The first is ecological fragility and the risk of over-tourism. The same scarcity and sensitivity that make the landscape compelling also make it vulnerable; uncontrolled visitor pressure, off-road driving across the seabed, waste accumulation and disturbance of wildlife could quickly erode the asset base. Carrying-capacity limits and effective protected-area management are therefore not bureaucratic niceties but conditions of sustainability. The second is the infrastructure and remoteness deficit: long distances, limited road and air access, and basic accommodation, water and sanitation services raise costs and constrain demand, which is why green-infrastructure investment features so prominently in the framework. The third is human-capital scarcity - the experience, competence and network gaps documented by Saidmamatov and colleagues [4] - which limits the quality and professionalism of services. The fourth is seasonality and climate: extreme summer heat, cold winters and dust storms compress the viable season and expose visitors and operators to climatic risk, a risk that is likely to intensify under climate change.

The water dimension deserves particular emphasis. In a basin whose crisis originated in the over-allocation of water, any new economic activity must be scrutinised for its hydrological footprint. Tourism is comparatively frugal, but it is not water-neutral: accommodation, sanitation and amenity landscaping all draw on scarce supplies, and poorly designed facilities could compete with domestic and ecological needs. Carrying-capacity assessment in this context must therefore be multi-dimensional, encompassing not only the physical and ecological tolerance of sites but also their water and energy budgets and the social acceptance of host communities. The same discipline that the green economy demands of agriculture and industry - producing more value from each litre and each kilowatt-hour - must be applied to tourism from the outset, so that the sector models rather than merely advocates resource efficiency.

A further, subtler risk is greenwashing and benefit leakage. If 'eco' branding outpaces substance, or if value is captured by external operators rather than local communities, tourism may deliver reputational gains without genuine green-economy outcomes. Credible certification, transparent benefit-sharing and community ownership are the safeguards. There is also a portfolio risk in over-reliance on a small number of flagship attractions or events; the temporary relocation of the Stihia festival away from Karakalpakstan following regional unrest in 2022 is a reminder that single-asset strategies are fragile and that diversification across the four asset categories of Table 2 is prudent.

4.3. Policy implications

Four policy implications follow. First, sequencing matters: because finance and capacity are the binding constraints, early public and donor investment should concentrate on accessible microcredit, blended finance and intensive capacity-building, creating the conditions under which private and community enterprise can subsequently scale. Second, integration matters: tourism planning should be embedded within regional land- and water-use planning and within the broader green-economy and restoration agendas, rather than pursued as a siloed sector, so that visitor infrastructure,

afforestation, renewable energy and water management are designed together. Third, inclusivity must be engineered, not assumed: explicit mechanisms for community ownership, local procurement and benefit-sharing are needed to ensure that growth reduces rather than reproduces inequality. Fourth, the region's special status should be leveraged: the 2021 United Nations designation and the associated trust-fund architecture provide a channel for concessional finance and technology transfer that few peripheral regions enjoy, and that should be actively used to de-risk green-tourism investment [7]. Table 5 distils these considerations into a strategic SWOT assessment.

Table 5. Strategic SWOT assessment of ecotourism-led green growth in the Aral Sea region.

Strengths	**Weaknesses**
Globally distinctive assets (Aralkum, Moynaq); strong policy tailwind; special UN status; low water intensity; national tourism momentum [3], [7]	Infrastructure and remoteness deficits; limited managerial capacity and networks; weak microfinance access; pronounced seasonality [4]
Opportunities	Threats
Concessional finance via trust funds; rising national arrivals; restoration-tourism synergies; community enterprise and crafts; geotourism and scientific tourism [5], [7]	Ecological fragility and over-tourism; climate extremes and dust storms; greenwashing and benefit leakage; over-reliance on single flagship assets

Source: authors' elaboration.

4.4. Limitations

This study is subject to the limitations of secondary, single-case research. It relies on published documents and statistics whose completeness and consistency vary, and several quantitative series - particularly historical visitor numbers to the region and the precise extent of the Aralkum - are approximate and drawn from sources using different methods and dates. The absence of primary fieldwork means that community perspectives are represented only indirectly, through the existing literature and agency reporting. The single-case design supports analytical, but not statistical, generalisation: the conceptual framework is intended as a transferable hypothesis to be tested in other degraded drylands rather than as a validated predictive model. Future research should incorporate primary data - visitor surveys, community interviews and enterprise-level financial analysis - and, where feasible, quasi-experimental evaluation of specific interventions such as microcredit schemes or guide-training programmes, in order to quantify the green-economy outcomes that this article has been able to characterise only qualitatively.

5. Conclusions

The Aral Sea region of Uzbekistan stands as both a warning and a test case. The desiccation of the sea and the rise of the Aralkum desert represent one of the most severe human-induced environmental disasters of the modern era, yet the same landscapes, together with the resilient culture of Karakalpakstan, constitute a distinctive and largely untapped tourism resource. This article has argued that ecological tourism can serve as a driver of the green economy in this arid, degraded setting, but only when it is treated as a system of mutually reinforcing mechanisms rather than as a single intervention. Six mechanisms - spatial planning and destination management, green finance and microcredit, capacity-building and skills, green infrastructure, marketing and interpretation, and inclusive governance - convert the region's natural, cultural and

community assets into environmental, economic and social outcomes, with a feedback loop that reinvests value into the assets themselves.

Two conditions are decisive. The first is sequencing: because access to finance and managerial capacity are the binding constraints identified in both the scholarly literature and the field, these must be addressed first, with concessional finance channelled through the region's special international status. The second is integration: tourism must be planned together with restoration, water management, renewable energy and climate-smart agriculture as part of a single green-development portfolio, so that visitor services and ecological recovery reinforce rather than undermine one another. Under these conditions, ecotourism is neither a panacea nor a marginal curiosity but a credible and replicable contributor to sustainable regional development. The framework advanced here is offered as a transferable template for other degraded drylands confronting the shared challenge of building prosperity on fragile ground.

REFERENCES

[1] United Nations Environment Programme, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Nairobi, Kenya: UNEP, 2011.

[2] World Tourism Organization and United Nations Environment Programme, Tourism in the Green Economy - Background Report. Madrid, Spain: UNWTO, 2012, doi: 10.18111/9789284414529.

[3] World Economic Forum, Travel & Tourism Development Index 2024: Insight Report. Geneva, Switzerland: World Economic Forum, 2024.

[4] O. Saidmamatov, U. Matyakubov, I. Rudenko, V. Filimonau, J. Day, and T. Luthe, 'Employing ecotourism opportunities for sustainability in the Aral Sea region: Prospects and challenges,' Sustainability, vol. 12, no. 21, art. 9249, 2020, doi: 10.3390/su12219249.

[5] S. Alikhanova and J. W. Bull, 'Review of nature-based solutions in dryland ecosystems: The Aral Sea case study,' Environmental Management, vol. 72, no. 3, pp. 457-472, 2023, doi: 10.1007/s00267-023-01822-z.

[6] President of the Republic of Uzbekistan, Resolution No. PP-4477 'On the Strategy for the Transition of the Republic of Uzbekistan to a Green Economy for 2019-2030' and the Uzbekistan-2030 Strategy. Tashkent, Uzbekistan, 2019.

[7] United Nations General Assembly, Resolution 'Declaring the Aral Sea region a zone of ecological innovations and technologies,' 75th session, New York, NY, USA, 18 May 2021.

[8] United Nations Development Programme, 'Karakalpakstan gears up for expansion of sustainable ecotourism,' UNDP Uzbekistan, 2023. [Online]. Available: https://www.undp.org/uzbekistan/press-releases/karakalpakstan-gears-expansion-sustainable-ecotourism

[9] National Aeronautics and Space Administration, 'World of Change: Shrinking Aral Sea,' NASA Earth Observatory. [Online]. Available: https://science.nasa.gov/earth/earth-observatory/world-of-change/aral-sea/

[10] Encyclopaedia Britannica, 'Aral Sea.' [Online]. Available: https://www.britannica.com/place/Aral-Sea

[11] World Bank, 'International tourism, number of arrivals - Uzbekistan,' World Development Indicators. [Online]. Available: https://data.worldbank.org/indicator/ST.INT.ARVL?locations=UZ

[12] National Statistics Committee of the Republic of Uzbekistan, 'Tourism and recreation,' Tashkent, Uzbekistan, 2024. [Online]. Available: https://stat.uz

[13] Global Sustainable Tourism Council, 'World Economic Forum Travel and Tourism Development Index 2024,' GSTC, 2024. [Online]. Available: https://www.gstc.org/wef-travel-tourism-development-index-2024/

[14] Euronews, 'Aral Sea crisis: Uzbekistan launches Aral Culture Summit to boost development in the region,' 7 Apr. 2025. [Online]. Available: https://www.euronews.com/green/2025/04/07/aral-sea-crisis-uzbekistan-launches-aral-culture-summit-to-boost-development-in-the-region

[15] Travel And Tour World, 'Moynaq, Uzbekistan - the ship graveyard of the Aral Sea and its growing role in heritage-eco tourism,' 2025. [Online]. Available: https://www.travelandtourworld.com/

[16] Saiga Conservation Alliance, 'Exploring the Aral Sea region: Conservation and ecotourism,' 15 Aug. 2023. [Online]. Available: https://saiga-conservation.org/2023/08/15/aral-sea-conservation-ecotourism/
[17] United Nations, 'Sustaining livelihoods affected by the Aral Sea disaster,' Human Security Unit, UN Trust Fund for Human Security. [Online]. Available: https://www.un.org/humansecurity/
[18] Stihia Festival, 'Stihia: Electronic music, arts and science festival, Moynaq, Uzbekistan.' [Online]. Available: https://stihia.org/