



"Start-Up Innovation's Contribution to Sustainable Ecotourism Development".

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Abstract:

This study explores the critical role of start-up organizations in advancing sustainable ecotourism .Start-ups are introducing innovative business models that explicitly prioritize environmental conservation and responsible travel practices. They actively foster partnerships with local communities, which promotes cultural preservation and stimulates economic development .By leveraging technology, these new ventures could create eco-friendly tourism experiences that effectively reduce the environmental impact of travel. Examples of this innovation include community-based platforms, certified green accommodation options, and essential carbon-offset services. Beyond their services, start-ups also play a key role in raising awareness about sustainable practices among both tourists and key stakeholders.

Their contributions are essential for transforming traditional tourism into more inclusive and resilient models. This research calls for urgent policy support to empower and scale these start-ups. It also offers practical recommendations to foster innovative ventures that advance ecotourism in Algeria, addressing local challenges and opportunities.

Keywords: Start-Up, Start-Up Innovation, Ecotourism, Sustainable Ecotourism.

JEL Classification Codes: O30, O31, Q01, Q56, L83, M31.

1. INTRODUCTION

Sustainable ecotourism is becoming increasingly important as the global tourist industry seeks to strike a balance between environmental preservation, cultural integrity, and economic development. In this ever-changing context, start-ups have emerged as dynamic catalysts, applying innovative technology and business models to revolutionize the perception and practice of ecotourism. These companies use cutting-edge technologies such as artificial intelligence, data analytics, and carbon offsetting mechanisms to create eco-friendly tourist experiences that develop authentic relationships between tourists and local communities.

More people are becoming aware of climate change and social fairness, which has increased the need for tourism that is sustainable and responsible. This has led new companies to come up with smart ideas that tackle environmental problems while also helping local communities and boosting economic strength. By bridging gaps between diverse stakeholders—travelers, host communities, and environmental organizations—start-ups inject agility and innovation into an industry traditionally constrained by legacy practices.

This paper investigates the multifaceted contributions of start-up innovation to the advancement of sustainable ecotourism. It explores the technological, social, and environmental dimensions of these emerging ventures. Furthermore, the study highlights prevailing challenges and offers recommendations for integrating disruptive start-up solutions into mainstream tourism frameworks to ensure long-term sustainability and inclusivity.

A. Research Problem

Despite the growing presence of start-ups in sustainable ecotourism, there is a limited understanding of how their innovations effectively contribute to environmental conservation, community engagement, and economic resilience. This study seeks to address this gap by examining the impact, challenges, and scalability of start-up-driven solutions in advancing sustainable ecotourism.

B. Objectives

- To discuss trends in technological development and service innovation relevant for the green and digital transformation of the

tourism industrial ecosystem.

- To test the capacity of start-ups to promote social inclusivity and community in the development of ecotourism.

2. Theoretical Background

2.1 Ecotourism and Sustainable

Ecotourism is a multifaceted concept that has evolved significantly over time, with various scholars and organizations offering different definitions. However, there is a consensus on its core principles and approaches. At its heart, ecotourism is about responsible travel to natural areas, a practice that aims to balance conservation, local community well-being, and education.

2.1.1 Definition of Ecotourism

Ecotourism has many definitions, but one clear set of principles. It alternative to other forms of tourism development, designed to ensure a positive feedback loop between tourism and conservation.

The term "**eco-tourism**" can be interpreted as a trip by a tourist to a remote area to enjoy and learn about nature, history, and culture in an area where tourism patterns help the economy of local communities and support the preservation of nature. (Iqbal, 2021, p. 21)

According to The International Ecotourism Society, "Ecotourism is responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education". (The International Ecotourism Society, 2015, p. 1).

Explicit definitions of ecotourism are the hypothesis that tourism, when designed and practiced as ecotourism, can benefit wildlife and biodiversity, create incentives to protect landscapes, and support local communities. (Amanda L.Stronza, 2019, p. 244)

Some critical aspects of eco-tourism are : (Iqbal, 2021, p. 22)

- The number of visitors is limited or arranged to fit the carrying capacity of the environment and socio-cultural community (vs mass tourism).

Eco-friendly tourism patterns (conservation value)

- Patterns of local culture and customs - Friendly tourism (educational and tourism value)
- This directly benefits the local economy (economic value)

- The initial capital needed for infrastructure is not large (the value of community participation and the economy).

Eco-tourism is a tourism activity that pays great attention to the preservation of tourism resources. Furthermore, as mentioned, there are three ecotourism perspectives, namely. (Iqbal, 2021, p. 22)

- **Ecotourism as a product** refers to attractions and activities that are directly based on natural resources.
- **Ecotourism as a market** represents travel that is specifically oriented toward environmental preservation efforts.
- **Ecotourism as a development approach** is a method of utilizing and managing tourism resources in an environmentally sustainable manner.

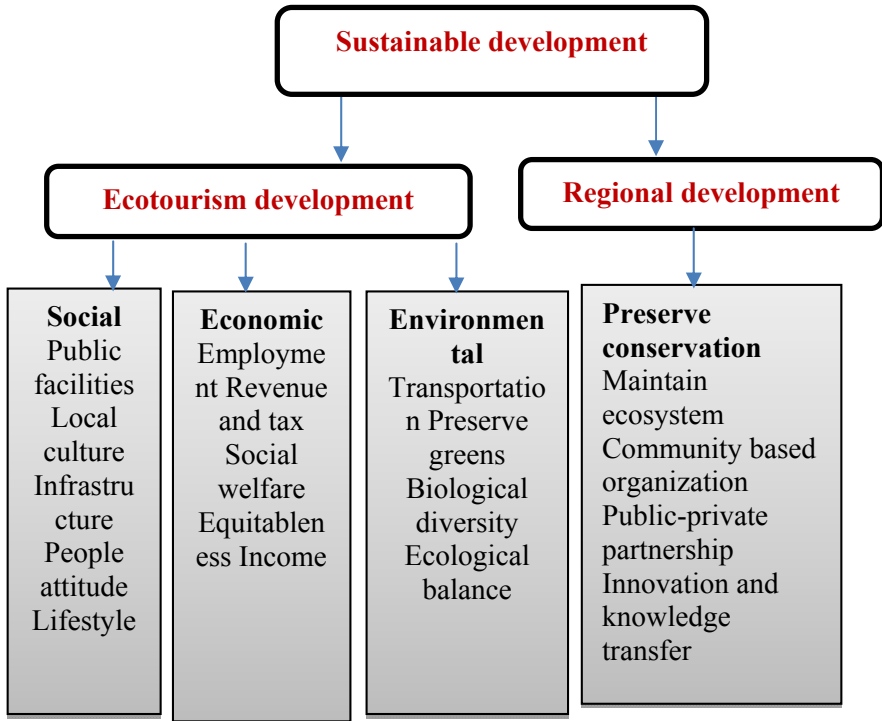
2.1.2 Sustainable Ecotourism

The use of ecotourism as a tool for sustainable development is a widely discussed topic around the world, with many countries already adopting this approach for regional growth. The core idea is that sustainable development can be achieved by simultaneously focusing on ecotourism and regional development within a specific area. (Parakh, 2022, p. 4867)

Ecotourism's effectiveness in this regard hinges on a delicate balance between environmental, economic, and social factors. To ensure long-term sustainability, these elements must be carefully managed. The approach can be broken down into three main focus areas: (Parakh, 2022, p. 4867)

- **Quality:** Ecotourism should provide a valuable experience for visitors while also improving the quality of life for the host communities. This can be achieved through preserving cultural identity, reducing poverty, and enhancing environmental quality.
- **Continuity:** The exploitation of natural resources must be kept at an optimal level, allowing for the preservation and regeneration of the environment. This ensures that the resources are available for future generations.
- **Balance:** There must be an equitable distribution of benefits among all stakeholders—the tourism industry, local communities, and the environment. This balance is crucial for meeting the needs of all parties involved and preventing conflict.

Fig.1. Sustainable development through ecotourism



Source: (Parakh, 2022, p. 4867)

Sustainable tourism is increasingly involving the private sector, which has led to a greater focus on site selection and evaluation that prioritizes environmental preservation. One key strategy is to use regional, eco-friendly building materials. These materials positively impact the environment by reducing global warming and are suitable for local conditions. Additionally, they can often be reused or recycled and benefit public health.

2.1.3. Smartness in ecotourism sustainability

The application of smart technologies has emerged as a transformative approach to enhancing the sustainability of ecotourism. This transformation centers on the Internet of Things (IoT), artificial intelligence (AI), and data analytics. These technologies collectively enable more efficient resource management, improved visitor experiences, and stronger environmental protection. IoT technologies

offer real-time monitoring of environmental indicators. These include water quality, air pollution, and wildlife habitats. With this information, stakeholders can promptly assess ecological conditions and implement timely conservation measures. This enhances biodiversity protection and minimizes the negative impacts of human activity. (Zhang, 2024, p. 4)

Artificial intelligence complements these efforts by enriching the tourist experience. AI-powered platforms enable immersive and interactive engagements, optimize travel routes, and personalize services according to individual preferences. Such features contribute to greater tourist satisfaction, loyalty, and cultural immersion, while also enhancing destination competitiveness and attracting environmentally conscious travelers. Data analytics further supports these innovations by providing tools for forecasting demand, optimizing performance, and developing predictive models. This enables more efficient use of resources, reduction of environmental footprints, and improvement of the economic sustainability of ecotourism sites. (Zhang, 2024, p. 4)

In addition, mobile applications, virtual reality (VR), and interactive platforms foster direct and personalized communication with tourists, promoting eco-conscious behavior. Research highlights that when visitor needs are addressed individually, it results in increased satisfaction, stronger loyalty, and a greater commitment to sustainability practices. Collectively, IoT, AI, and data analytics represent critical enablers of sustainable ecotourism, as they allow for continuous monitoring, data-driven decision-making, and inclusive stakeholder engagement. By adopting these technologies, the tourism sector can transition toward a model of growth that is not only economically viable but also environmentally responsible and socially inclusive. (Zhang, 2024, p. 4)

2.2 Start-up and sustainable innovations

2.2.1 Definition of « Start-up »

A *start-up* is commonly defined as a newly established business venture that aims to create and scale an innovative product or service under conditions of extreme uncertainty. According to Ries, a start-up is "a company that is in the first stages of its operations. These

companies are often funded by their founders and may aim to develop a new product or service for which there is a market demand". (Ries, 2011, p. 27) This definition emphasizes experimentation with business models and rapid iteration in early-stage companies. Blank & Dorf further clarify that a start-up is a temporary organization designed to search for a repeatable and scalable business model. (Blank, 2012, p. 10). Where Sutter defines a startup as are new firm established with the intention of developing a unique product or service and bringing it to market. They are characterized by high uncertainty, rapid growth potential, and a focus on innovation (Sutter, 2017, p. 45).

Additionally, Skawińska and Zalewski describe a start-up as "a young, small, independent, creative, and innovative company, usually engaged in research and development, aiming to solve real problems with attractive business models and talented teams". (Skawińska, 2020, p. 134) This highlights the innovation and growth potential that differentiate start-ups from traditional small businesses.

By definition, startups are new ventures created with the intention to grow as fast as possible and scale with the utmost efficiency. They are mostly associated with innovation, high growth rates, and disruptive potential. In the instance of sustainable startups, these businesses do not just create models that are only economic but are integrative of both environmental and social impacts for positive long-term results. (Taksh, 2024, p. 2)

Ecotourism startups are on a mission to develop travel routes that have zero negative impact on nature. Their services can include community-oriented projects, wildlife protection, sustainable organic farming, etc. New business models support ecological tourism, such as channelling the price of the tour directly into local projects that help environmental protection. (Izsak, 2023, p. 19)

2.2.1. Strategies for Startups Leading Sustainable Innovation

Innovation serves as a fundamental driver for the creation of new markets and solutions, addressing unmet needs while generating fresh opportunities. Start-ups, characterized by their flexibility and innovation-oriented culture, are uniquely positioned to advance the Sustainable Development Goals (SDGs) through both technological and social innovations.. (Boulahlib, 2024, p. 26)

2.2.1.1. Technological Innovation :

One of the most effective ways startups drive sustainable innovation is by leveraging cutting-edge technologies to address pressing environmental challenges. By harnessing advancements across diverse technological domains, these ventures are able to design high-impact solutions that frequently disrupt conventional operational models and promote more sustainable practices. The following identifies key areas where technological innovation is driving sustainable solutions : (Taksh, 2024, p. 6)

- Renewable Energy Technologies:

a. Advanced Solar and Wind Technologies: Startups are at the forefront of renewable energy innovation by developing more efficient solar panels and wind turbines that maximize energy capture and conversion rates. Emerging solutions such as flexible solar panels, bifacial solar modules, and vertical-axis wind turbines reflect significant advances aimed at improving both efficiency and adaptability in diverse environmental conditions.

b. Energy Storage Solutions: To address the intermittency inherent in renewable energy generation, startups are pioneering advanced storage technologies, including high-capacity batteries, flow batteries, and innovative systems such as pumped hydro and compressed air energy storage. These solutions enhance the reliability and predictability of renewable energy by enabling the storage of surplus power for use during periods of low generation.

- Waste reduction technologies:

a. Circular Economy Solutions. Startups are playing a critical role in advancing circular economy principles by developing technologies that enable the recycling and upcycling of waste materials into new, valuable products. Innovations in this area include state-of-the-art sorting technologies, chemical recycling methods for plastics, and systems that convert organic waste into resources such as compost or biogas. These solutions not only reduce environmental impact but also extend the lifecycle of materials within the economy.

b. Waste-to-Energy Systems. Other startups focus on transforming waste into renewable energy through processes such as anaerobic digestion, gasification, and pyrolysis. These technologies serve a dual

purpose: reducing the volume of waste while simultaneously producing clean energy. In this way, waste-to-energy solutions contribute to both sustainable waste management and renewable energy generation, reinforcing the shift toward a more circular and resource-efficient economy.

- Eco-Friendly Materials:

a. Sustainable Packaging. Startups are pioneering alternatives to conventional single-use plastics by designing biodegradable, compostable, and recyclable packaging solutions. Notable innovations include plant-based bioplastics, mushroom-based packaging, and seaweed-derived materials, all of which maintain the functional properties of traditional packaging while significantly reducing environmental harm. These approaches help minimize plastic waste and contribute to broader sustainability goals.

b. Green Building Materials. Emerging technologies in construction are enabling the development and adoption of low-carbon building materials. Startups are driving advances in low-carbon concrete, recycled steel, and eco-friendly insulation derived from renewable resources. Such innovations reduce the ecological footprint of construction and renovation projects by lowering carbon emissions and promoting the use of recycled or renewable inputs, thereby aligning the built environment with sustainable development objectives.

- Efficient Resource Management:

- Smart Agriculture Technologies: Startups are using technology to optimise agriculture practices, which would lead to lower resource consumption. These innovations include precision agriculture tools in observing crop health, optimising water use, and reducing the usage of chemical fertilisers and pesticides.

- Water Technologies: Startups are increasingly advancing solutions that improve water efficiency in response to global water scarcity. Cutting-edge technologies such as advanced filtration systems, smart irrigation, and water recycling innovations are being applied across both industrial and domestic contexts. These approaches not only optimize water management but also significantly reduce wastage, contributing to more sustainable resource use.

- Transportation and Mobility Solutions:

a. Electric and Autonomous Vehicles: Startups are at the forefront of developing electric vehicles (EVs) and autonomous driving technologies, which hold considerable potential for reducing greenhouse gas (GHG) emissions and enhancing transport efficiency. Complementary innovations in EV charging infrastructure and vehicle-to-grid technologies further support the transition toward sustainable mobility systems.

b. Alternative Fuels: Startups are also investing in research and innovation around alternative fuels such as hydrogen and biofuels. By developing cleaner methods of production and application, these technologies provide more sustainable alternatives to fossil fuels, reducing both emissions and dependency on finite energy sources.

In brief, technological innovation forms the foundation of sustainability-oriented strategies pursued by startups. Building on advances in renewable energy, waste reduction, ecological materials, resource management, and mobility systems, startups have made significant contributions to sustainability. Their ability to integrate state-of-the-art technologies into practical applications not only addresses urgent environmental challenges but also sets new benchmarks for sustainable development across industries.

2.2.1.2. Business Model Innovation and Theories

Sustainability-oriented startups often adopt innovative business models based on the circular economy. These models aim to minimize waste, optimize resources, and extend product life cycles. Startups are shifting from linear models—where products are made, used, and discarded—to systems that offer both sustainability and new value to consumers. The following outlines key business model innovations driving sustainable practices among startups: (Taksh, 2024, p. 7)

Product-as-a-Service (PaaS):

a. Subscription-Based Models. Startups are increasingly adopting *Product-as-a-Service* (PaaS) models, where customers subscribe to or rent products rather than purchasing them outright. This access-over-ownership approach reduces waste by ensuring that products are returned, refurbished, and reintroduced into the market. For instance, companies that lease high-end electronics such as laptops or

smartphones not only reduce electronic waste but also ensure that consumers have access to updated technology on a regular basis.

b. Durability and Maintenance. By retaining product ownership, startups have strong incentives to design goods that are durable, easy to maintain, and cost-effective over their lifecycle. This business logic aligns profitability with sustainability, as products that last longer generate value through repeated use. Examples include outdoor equipment or clothing companies that lease high-performance gear under take-back schemes, offering regular maintenance and upgrades while extending product life.

c. Product Take-Back and Recycling. Another innovative model involves companies reclaiming products at the end of their life cycle for refurbishment, recycling, or repurposing. This approach closes the loop in product life cycles, reducing waste and recovering valuable materials. For example, several clothing companies have implemented take-back programs that collect worn garments to recycle fibers into new products, thereby reducing textile waste and the demand for virgin resources.

d. Incentivized Returns. Some startups actively encourage customers to return used products by offering rewards such as discounts, credits, or loyalty points. This fosters responsible consumer behavior and allows companies to reclaim materials for reuse or recycling. A common example is electronics firms implementing trade-in schemes where customers exchange old devices for credit toward new purchases, enabling the refurbishment or recycling of the returned items.

2.3. Innovations in Ecotourism by Startups

2.3.1. Technological Innovations

Startups are integrating smart technologies into ecotourism to enhance efficiency and minimize environmental impact. For example, Zhang and Deng (2024) note that “smart ecotourism, utilizing smart technologies like smartphones, artificial intelligence (AI), and the Internet of Things (IoT), aims to minimize harm to natural and cultural ecosystems, promoting education and environmental conservation” (Zhang, 2024, p. 14). Digital platforms now offer highly personalized travel planning and immersive experiences. Technopolis

Group (2023) reports that modern tourism startups are shifting from simple booking platforms to “platforms that are more personalised and underpin the sharing economy”, often using AI, big data, augmented/virtual reality, and even blockchain to create new customer experiences. (Izsak, 2023, p. 13) (Zhang, 2024, p. 14). These technologies enable tourists to, for example, follow eco-friendly routes or participate in virtual nature experiences, while startups harness big data and AI to optimize resource use and reduce waste. (Zhang, 2024, p. 13)

Startups also leverage digitalization for community capacity building and marketing. Zainol, Abdullah, and Rahman (Zainol N. R., 2023, p. 65) emphasize that information and communication technology is transforming eco-villages into digital hubs: “the advent of information and communication technologies required a major transformation of eco-tourism sectors by redesigning all processes innovatively.” In practice, this means eco-tourism startups use online marketplaces and apps to connect local guides and artisans directly with travelers, expanding rural tourism entrepreneurship. Such platforms often integrate IoT sensors or mobile apps to monitor environmental data or educate visitors, reinforcing conservation messaging. Collaboration of startups with governments and communities is key; Zhang and Deng (Zhang, 2024, p. 14) highlight that successful smart-ecotourism policies result from “collaboration with governments, local stakeholders, and Organizations.”

2.3.2. Sustainable Practices Innovations

Ecotourism startups are pioneering green business models and circular practices. The Technopolis report (Izsak, 2023, pp. 12-13) documents a surge in tourism startups addressing environmental challenges: alongside digital tools, many young companies focus on recycling, waste reduction, sustainable mobility, and other green services. For instance, startups develop sharing-economy solutions (bike or gear rentals) that cut resource use, and apps to coordinate food-waste redistribution. These ventures often reinvest a portion of profits into conservation projects. More broadly, Rodrigues, Kornieieva, and Vicente Rodrigues (Baptista Rodrigues, 2024, p. 301) describe “green startups” aligned with ESG goals and the UN

SDGs, noting that tourism entrepreneurs now embed sustainability into their core strategies. Such startups directly contribute to SDGs on sustainable production (SDG 12) and environmental protection (SDG 14) by innovating eco-friendly travel products and operations (Baptista Rodrigues, 2024, p. 305).

In practice, this means startups are creating zero-waste tours, eco-lodges powered by renewable energy, and community farms that supply tourist lodgings. For example, ecotourism startups often channel tour proceeds into local conservation (e.g., financing wildlife sanctuaries) as part of their business model. The green start-up movement in tourism is growing: a Technopolis analysis shows that while digital tourism companies remained more numerous initially, startups focused on environmental solutions steadily increased since 2012, even during the pandemic (Izsak, 2023, p. 1008). By prioritizing renewable energy, waste management, and resource efficiency, these young companies set new sustainability standards. As Rodrigues et al. conclude, innovation and sustainability together are “determining the future of tourism”, with startups acting as “agents of change” toward more responsible practices (Baptista Rodrigues, 2024, p. 307)

2.3.3. Community Involvement Innovations

Startups in ecotourism often center on local participation and social entrepreneurship. Many ecotourism ventures are founded by or partnered with community members, ensuring that local people benefit. Zainol, Rahman, Ab Rahman, and Mohd Yasin (Zainol N. R., 2023, p. 55) emphasize that social entrepreneurship in ecotourism drives local development: it provides income and jobs, empowers marginalized groups, and mobilizes traditional knowledge. In underdeveloped rural areas, ecotourism startups become viable local industries, with entrepreneurs designing tours that highlight cultural heritage. For example, community-based platforms might let villagers offer homestays or guided nature walks, directly involving residents. These models align with the findings that collaboration across stakeholders is crucial: smart-ecotourism requires government and industry to co-create value with local communities. (Zhang, 2024, p. 14) (Zainol N. R., 2023, p. 58)

Empowering women and minorities is a key aspect of

innovation. Aghdasi, Omid Najafabadi, and Hosseini (Aghdasi, 2023, p. 12) study rural Iranian women's entrepreneurship and find that community support and changing social norms strongly influence startup success in ecotourism. They report that when "local and regional institutions" endorse women's roles and families provide "support...with strong bonds of commitment, solidarity", rural women gain confidence to launch eco-lodges and guides. In short, acceptance by the community creates demand for women-led ecotourism ventures. This shows that startups aren't just technological innovators but also social innovators: by building networks and education programs, they transform attitudes. Overall, these ecotourism enterprises illustrate how engagement with local culture and inclusive governance is a form of innovation—one that enhances sustainability by ensuring that economic benefits and stewardship responsibilities are shared with host communities. (Aghdasi, 2023, p. 59) (Zainol N. R., 2023, p. 17)

2.4. Challenges and Scalability of Start-up-driven Solutions in Advancing Sustainable Ecotourism

Although start-ups have a lot of potential to promote sustainable innovation in ecotourism, there are several interconnected obstacles that limit the implementation and scale of their solutions.

- **Financial constraints.** Many ecotourism start-ups require substantial upfront capital (for renewable installations, infrastructure, and community programs) yet face difficulties accessing green finance and patient capital; this restricts long-term planning and scale-up. Targeted blended finance, grants, and catalytic instruments can ease this constraint but remain unevenly available across regions. (Izsak, 2023, p. 48) (Fu, 2024, p. 8)
- **Market penetration and consumer willingness to pay.** Demand for sustainable tourism is rising but remains uneven geographically and across market segments. Start-ups often operate in niche markets and must invest in consumer education and marketing to justify premium pricing for eco-friendly services, limiting rapid scaling. (Izsak, 2023, p. 54)
- **Regulatory and institutional barriers.** Weak or inconsistent policy frameworks, unclear permitting processes, and the absence

of harmonized sustainability standards can slow innovation adoption. Where policy is supportive (clear incentives, certification schemes, regulatory sandboxes), start-ups scale more readily. (Fu, 2024, p. 11) (Izsak, 2023, p. 55)

- **Technological and operational integration.** Cutting-edge technologies (AI, IoT, renewable systems) require technical capacity, maintenance, and integration with legacy infrastructure — especially in remote destinations. Operational reliability, staff training, and remote maintenance costs can limit adoption and replication of tech solutions (Zhang, 2024, p. 13).
- **Community engagement and social acceptance.** Ecotourism success depends on local buy-in. Start-ups must negotiate cultural norms, trust, and fair benefit distribution; failure to ensure equitable participation undermines legitimacy and sustainability. (Dasan, 2022, p. 3)
- **Scalability and replicability.** Many start-up models work well at a small scale but face difficulty replicating across different ecological, cultural, and regulatory contexts without adaptation. Conceptual work on scalable sustainable business models highlights modular design, strong networks, and hybrid organizational forms as important enablers, but these require deliberate strategy and resources. (Dasan, 2022, p. 4)
- **Implications — What helps scale successful solutions:** improved access to green finance and blended funding; policy clarity and certification schemes; strategic partnerships with incumbents, NGOs, and governments; and participatory community co-design and benefit-sharing mechanisms. (Fu, 2024, p. 12) (Izsak, 2023, p. 70)

3. Examples of startups that contribute to ecotourism :

In response to the increasing global concern for sustainable travel, numerous innovative solutions have emerged through the initiatives of travel start-ups. These enterprises seek to democratize access to sustainable tourism by making it more practical, affordable, and user-friendly. In addition, such start-ups foster direct interactions between travelers and local communities, thereby generating economic opportunities for residents while promoting cultural

exchange. This model not only supports local livelihoods but also enhances the authenticity of travel experiences. Sustainable travel start-ups thus play a pivotal role in advancing eco-friendly practices within the tourism sector, serving as catalysts for both environmental stewardship and community development. Some notable examples of start-ups that play an important role in advancing sustainable tourism and ecotourism include:

Table 1. Notable start-ups : innovations and impact on ecotourism

<i>Start-up</i>	<i>Country/Region</i>	<i>Key Innovation</i>	<i>Impact on Ecotourism</i>
<i>Travel-to-Nature</i>	Costa Rica	Reforestation, local guide training, and eco-education	Enhanced biodiversity, local employment, scalable, sustainable tourism models
<i>NotOnMap</i>	India	Community-based immersive travel, cultural exchange	Preservation of rural heritage, sustainable income for marginalized communities
<i>Spring Valley Farm</i>	India	Agri-ecotourism, eco-village resorts, and education	Conservation, grassroots sustainable practices, and eco-education for diverse visitors
<i>Ecovista</i>	Tunisia	VR ecotourism, local guide connection	Promotes lesser-known destinations, fosters cultural engagement, and local pride
<i>Lakenergy Srl</i>	Italy	E-mobility (e-boats, e-bikes),	Low-carbon transport options,

Green Tickets	Europe	shared experiences	regional ecotourism growth around lakes
		Sustainable route planning platform	Encourages eco-friendly travel, reduces carbon footprint
I Like Local	Asia, Africa	Indigenous-led tours & homestays	Direct economic benefits support indigenous knowledge and conservation
Live Electric Tours	Portugal	Self-drive electric vehicle city tours	Reduces emissions in urban tourism, combines tech and sustainability

Source: prepared by the researcher.

These startups, among others, demonstrate how entrepreneurship and technological innovation are powering the next wave of sustainable travel alternatives. Their efforts help foster biodiversity conservation, reduce tourism's environmental footprint, and generate socio-economic benefits for local communities—all central goals in the modern ecotourism movement.

4. Ecotourism and Sustainable Development in Algeria: Local Realities and Future Opportunities :

Algeria possesses exceptional ecological and cultural diversity, positioning it among the most promising countries in North Africa for sustainable and ecotourism development. Extending from the Mediterranean coast to the Sahara Desert and encompassing mountainous and forested regions, Algeria's natural landscapes represent valuable ecological assets and untapped economic potential. These resources provide an opportunity to promote a model of tourism that aligns with environmental protection, community development, and cultural preservation. (Zerouati & Boukhaoua, 2025, p.79).

4.1 Opportunities:

The potential of ecotourism in Algeria extends beyond environmental preservation. It also serves as a vehicle for local development and community empowerment. In many regions, ecotourism activities—such as eco-lodging, guiding, handicrafts, and traditional gastronomy—have contributed to job creation and the revival of local know-how. For example, initiatives in El Kantara, Bejaia, and the southern oases demonstrate that small-scale, community-based projects not only maintain biodiversity but also generate sustainable income for residents (Boutarcha & Boukhezer, 2022, p :65).

Ecotourism also supports the protection of Algeria's unique natural and cultural heritage. National parks such as Ahaggar and Tassili n'Ajjer are listed as UNESCO World Heritage sites (Serfou, 2022.p :328). The growing use of digital tools and renewable energy signals a shift toward more sustainable business models. Startups and youth-led initiatives are leveraging digital marketing, eco-friendly accommodations, and circular economy practices to enhance Algeria's competitiveness in regional and international markets (Benabderrahmane, N., & Benbouzid, K, 2025,p.182)..

4.2 Challenges:

Despite these positive dynamics, the ecotourism sector in Algeria continues to face structural and operational challenges. The lack of adequate infrastructure and transportation networks limits access to natural sites, while insufficient investment and coordination between institutions hinder the scaling-up of successful local experiences (Cherif & Belaidi, 2022, p:150). Furthermore, the absence of a coherent national ecotourism strategy, coupled with weak promotion and limited training opportunities for local actors, constrains the sector's development potential (Merras & Elmogherbi, 2025;p:134, Benhah, 2024, p:).

Environmental awareness remains uneven across regions, and the mechanisms for financing sustainable tourism initiatives are still underdeveloped. While Algeria's Vision 2035 recognizes tourism as a key pillar of economic diversification, the country's regulatory and investment frameworks are not yet adapted to attract substantial green

investment or international partnerships (Zerouati & Boukhaoua, 2025, pp. 90-91). The COVID-19 crisis also revealed the sector's fragility, emphasizing the need for locally resilient models of tourism that prioritize sustainability and community involvement. (Benabderrahmane, N., & Benbouzid, K, 2025,p.180).

Ecotourism in Algeria has the potential to drive sustainable economic diversification, environmental conservation, and social inclusion. A successful strategy requires integrating environmental, economic, and social dimensions, strengthening institutions, improving infrastructure, encouraging innovation, and empowering local communities. Aligning ecotourism policies with local development plans and international standards can create a resilient tourism sector, enhance Algeria's global image, and preserve its natural heritage.

Algeria can foster green and sustainable tourism, despite its current limited economic impact, by implementing the following recommendations:

1. Develop community-based ecotourism in protected and rural areas like Tassili n'Ajjer and Hoggar National Park.
2. Encourage public-private partnerships to invest in environmentally friendly accommodations and transportation.
3. Integrate sustainability principles into tourism education and training to build local expertise.
4. Incentivize green practices in hospitality and tour operations through fiscal measures.
5. Align national tourism policy with the SNDD 2035 and the National Renewable Energy and Energy Efficiency Program.

5. CONCLUSION

Start-ups are becoming major drivers of sustainable ecotourism by transforming innovative ideas into scalable solutions. They deploy technologies such as AI for itinerary planning, IoT for resource monitoring, and digital marketplaces to enhance operational efficiency, reduce environmental impact, and expand access to eco-friendly travel options. They also adopt sustainability-oriented business models (renewable energy, circular economy, waste-to-energy, green materials) and social innovations (community-based

enterprises, revenue-sharing, women-led cooperatives, participatory design) to shift economic benefits locally and make tourism more inclusive. Despite their potential, growth is hindered by several barriers, including limited green finance, regulatory complexity, operational challenges in remote areas, and issues with community engagement. To scale, start-ups need a supportive ecosystem featuring targeted finance (blended instruments, grants), flexible policy frameworks (pilot “sandbox” programmes, certification), strategic partnerships, and local capacity building. In sum, start-ups are not just service providers but system transformers; with the right policy, finance, and stakeholder collaboration, they can redefine ecotourism around sustainability, equity, and resilience.

In conclusion, while Algeria's path to becoming a global ecotourism leader faces structural constraints, the synergy between immense natural capital and the agility of innovative start-up entities provides a powerful mechanism for achieving economic diversification and true sustainable development.

Based on the findings of this study, several actionable recommendations are proposed to strengthen the ecosystem for innovative start-ups and promote the sustainable development of ecotourism in Algeria.

1. Establish Dedicated Financing Mechanisms:

Create specialized *green investment funds* and *ecotourism incubators* for start-ups in sustainable tourism. Combine grants, seed funding, and low-interest loans tied to clear sustainability criteria, such as environmental performance, community inclusion, and carbon footprint reduction. Use public-private partnerships to mobilize resources and reduce risks in early-stage green innovation investments.

2. Simplify and Harmonize Regulatory Frameworks:

Current administrative procedures hinder small, innovative enterprises in Algeria. Introduce a 'Green Lane' for ecotourism ventures to speed up land-use permits, business licenses, and environmental approvals. Simplify regulations and provide clear conservation agreements to encourage entrepreneurship while protecting sensitive ecological areas.

3. Enhance Digital and Technological Infrastructure:

Digital connectivity is essential for modern ecotourism enterprises that rely on online marketing, booking systems, and smart resource management. Expanding broadband and mobile internet coverage in key ecotourism zones, especially rural and desert regions, would empower start-ups to develop competitive digital platforms, improve service delivery, and attract international visitors. Additionally, fostering partnerships between telecommunications companies and tourism agencies could accelerate Algeria's digital transition in this sector.

4. Invest in Human Capital and Capacity Building:

Developing the skills and competencies of local populations is essential for ensuring the sustainability and inclusiveness of ecotourism. Collaborative programs between universities, vocational training centers, and tourism operators should be established to enhance expertise in sustainable tourism management, ecotourism guiding, environmental education, and digital entrepreneurship. Capacity-building initiatives should also focus on women and youth, enabling them to participate effectively in the creation of start-ups and in destination management.

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