

DEVELOPMENT OF SUSTAINABLE TOURISM DESTINATIONS TO INCREASE TOURIST ATTRACTIVENESS FROM THE QUINTUPLE HELIX PERSPECTIVE IN SINJAI DISTRICT

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ABSTRACT

This study aims to describe the development of sustainable tourism destinations in Sinjai Regency and analyze the roles of actors within the Quintuple Helix framework. Utilizing a descriptive qualitative approach, data is collected through observation, in-depth interviews, and document analysis, which are then analyzed interactively. The results indicate that implementing the Quintuple Helix concept positively impacts tourist attraction, as the synergy among government, academics, business actors, civil society, and the environment strengthens the tourism ecosystem. Innovation in facilities, including accommodation and accessibility, is crucial for enhancing tourist appeal. However, challenges related to infrastructure and competition with privately managed attractions must be addressed to achieve optimal development. Effective management of tourist sites is essential for supporting local businesses. Tourism development has the potential to improve community welfare through economic growth, relying on cooperation among stakeholders, capacity building, and sustainable resource management. Increased training for business actors and responsive policies from the Tourism and Culture Office are necessary. By involving all elements of the Quintuple Helix approach and adhering to sustainability principles, Sinjai Regency can become an attractive tourist destination that enhances community welfare while supporting cultural and environmental preservation. Future research should analyze the influence of sustainable tourism on the economic, social, and environmental aspects of the local community to provide recommendations for formulating more effective sustainable development policies and programs.

Keywords: quintuple helix; sustainable tourism; community; tourist attractiveness; natural environment

PENGEMBANGAN OBJEK WISATA BERKELANJUTAN UNTUK MENINGKATKAN DAYA TARIK WISATAWAN DALAM PERSPEKTIF QUINTUPLE HELIX DI KABUPATEN SINJAI

ABSTRAK

Penelitian ini bertujuan untuk mendeskripsikan pengembangan objek wisata berkelanjutan di Kabupaten Sinjai serta menganalisis peran dan kerangka kerja aktor dalam Quintuple Helix. Penelitian ini menggunakan pendekatan kualitatif dengan jenis deskriptif, dan data dikumpulkan melalui observasi, wawancara mendalam, dan penelusuran dokumen, yang kemudian dianalisis secara interaktif melalui proses kondensasi, penyajian, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa pengembangan objek wisata berkelanjutan dengan menerapkan konsep Quintuple Helix memberikan dampak positif dalam menarik wisatawan karena sinergitas antara pemerintah, akademisi, pelaku bisnis, masyarakat sipil, dan lingkungan telah memperkuat ekosistem pariwisata. Inovasi dalam penyediaan fasilitas, termasuk akomodasi dan aksesibilitas, menjadi faktor penting yang dapat meningkatkan daya tarik bagi wisatawan. Namun, tantangan terkait infrastruktur dan persaingan dengan objek wisata yang dikelola oleh pihak swasta harus diatasi untuk mencapai pengembangan yang optimal dan pengelolaan objek wisata yang efektif berperan penting dalam mendukung pelaku usaha di sekitar lokasi wisata. Pengembangan pariwisata berpotensi meningkatkan kesejahteraan masyarakat melalui pertumbuhan ekonomi yang bergantung pada kerjasama antara pemangku kepentingan, peningkatan kapasitas, dan pengelolaan sumber daya alam yang berkelanjutan. Oleh karena itu, peningkatan pelatihan bagi pelaku bisnis dan kebijakan responsif dari Dinas Pariwisata dan Kebudayaan sangat diperlukan. Dengan melibatkan semua elemen dalam pendekatan Quintuple Helix dan menerapkan prinsip keberlanjutan, Kabupaten Sinjai memiliki potensi untuk menjadi destinasi wisata yang menarik sehingga meningkatkan kesejahteraan masyarakat serta mendukung pelestarian budaya dan lingkungan. Untuk penelitian berikutnya, disarankan untuk mengkaji analisis pengaruh objek wisata berkelanjutan terhadap aspek ekonomi, sosial, dan lingkungan masyarakat setempat supaya dapat menghasilkan rekomendasi dalam merumuskan kebijakan dan program pembangunan berkelanjutan yang lebih efektif.

Kata kunci: quintuple helix; pariwisata berkelanjutan; masyarakat; wisatawan; lingkungan alam

INTRODUCTION

Tourism development significantly enhances the economy, preserves local culture, and protects the environment. However, challenges persist in maintaining product quality and sustainability. Sustainable tourism often faces issues related to resource exploitation for economic gain, necessitating support from government, industry, and society. Effective sustainable tourism development requires a focus on environmental awareness and the improved management of vulnerable areas, along with the implementation of eco-friendly strategies. The quintuple helix innovation model supports sustainable development across economic, ecological, and social dimensions, creating synergy among these aspects. This model fosters a win-win situation among ecology, knowledge, and innovation, integrating skills and natural environmental systems for effective quality-based management (Carayannis et al., 2017). It also encourages organizations to adopt a sustainable culture, enhancing their reputation through environmental awareness (Mineiro et al., 2021). In tourism, implementing the quintuple helix approach to halal tourism is expected to increase visitor numbers, while maintaining and developing tourist attractions is crucial for enhancing Indonesia's competitiveness (Herliana & Qorina, 2024).

Sustainable tourism is increasingly vital for addressing rising carbon emissions, as highlighted by recent studies. Key strategies include utilizing electric vehicle charging stations, planning efficient trips, and opting for alternative transportation such as trains and buses. Additionally, practicing eco-driving and supporting renewable fuels can further reduce emissions. Prioritizing eco-tourism and raising awareness about the environmental impact of travel are essential for fostering a collective effort toward a greener future in the tourism sector (Safaa et al., 2023). Integrating local and global perspectives is crucial for achieving sustainable tourism, as adopting the concept of glocalization helps manage tourism dynamics and effectively supports local development (Palazzo et al., 2022).

Sustainable development and decision-making amidst environmental uncertainty should be a primary focus (Barcellos-Paula et al., 2021). In Indonesia, tourism development aims to enhance economic growth and community welfare (Sumarto et al., 2020). Achieving the Sustainable Development Goals (SDGs) presents a significant challenge for governments globally, necessitating active participation from all stakeholders. Consequently, policymakers emphasize the importance of advancing the tourism sector as a

strategic approach to meet the SDGs (Khizar et al., 2023). Sinjai Regency, located in South Sulawesi Province, boasts considerable natural resource potential, particularly in tourism. The tourism development policy outlined in the Regulation of the Minister of Tourism and Creative Economy Number 9 of 2021 integrates social, economic, cultural, and environmental sustainability. The local government manages 15 tourist attractions, including the Tongke-Tongke Mangrove Forest and Bulokkong Beach, based on local wisdom to stimulate economic growth. The Tourism Forum, established under Regional Regulation Number 19 of 2019, facilitates stakeholder engagement, ensuring a comprehensive approach to sustainable tourism development.

The quintuple helix model offers an innovative approach to sustainable development, involving five key actors: government, academia, industry, society, and the natural environment. This model underscores the necessity for collaboration to establish a sustainable knowledge-based economy (Cai, 2022). Community empowerment in sustainable tourism can generate jobs and enhance tourist loyalty through improved infrastructure, access, security, hospitality, and professional tour guides (Yuanitasari et al., 2024). However, challenges in Sinjai Regency's sustainable tourism development persist, including unclear roles among actors, suboptimal coordination, insufficient focus on environmental aspects, and low visitor awareness of the "Ayo Ke Sinjai" application. This lack of understanding undermines the application's effectiveness in enriching tourist experiences. Addressing these challenges is essential for fostering innovation and sustainability in the tourism sector. Sustainable development is vital for achieving developed country status, as industrial growth often leads to social and environmental damage (Amrial et al., 2017). Collaborative actions within the quintuple helix model are crucial for driving environmental innovation and mitigating climate change (Durán-Romero et al., 2020).

In Indonesia, the integration of information and communication technology (ICT) plays a critical role in transforming tourism policies. Multisectoral collaboration among stakeholders is essential for developing effective digital transformation strategies that foster sustainable tourism initiatives while adapting to emerging challenges (Nanda et al., 2023). This ongoing evolution underscores the importance of continuous adaptation and innovation within the tourism sector. Sustainable tourism development is an integrated approach aimed at enhancing quality of life through effective management of natural and cultural resources.

It emphasizes meeting the needs of tourists while ensuring environmental sustainability for present and future generations. This process necessitates stakeholder involvement and the empowerment of local communities, optimizing resource utilization, respecting local cultural authenticity, and supporting long-term economic management. Success in tourism development hinges on transforming tourist attractions into appealing tour packages as superior products (Sulistiyadi et al., 2021). The Quintuple Helix Model underscores the transformation of modern societies and economic systems within the framework of sustainable development at the international level (Andryeyeva et al., 2020). In Sinjai Regency, tourism development faces obstacles, including limited supporting infrastructure, low-quality human resources, and minimal investment, which hinder innovation and the creation of attractive tourism products. This study aims to describe sustainable tourism development in Sinjai Regency and analyze the roles of actors within the Quintuple Helix framework.

METHOD

To achieve the research objectives, a descriptive qualitative approach was utilized (Taylor et al., 2015). This methodology seeks to understand, describe, and provide comprehensive information about sustainable tourism development systematically and accurately. The study focuses on enhancing tourist attraction in Sinjai Regency through a quintuple helix perspective. Data were categorized into primary and supporting types.

Primary data were gathered through direct observation of tourist attractions, including nature, cultural, and marine tourism, as well as interviews with three groups: tourism managers, business operators, and tourists, conducted over two months. Supporting data were collected through documentation techniques, encompassing official documents, relevant photographs, websites, news articles, and books.

The validity of the data was ensured through triangulation techniques, comparing interview and observational data with documentation. Data analysis followed the interactive techniques described by Miles et al. (2014), including data condensation, data display, and conclusion drawing to formulate recommendations for sustainable tourism management in Sinjai Regency.

RESULTS AND DISCUSSION

Portrait of Sustainable Tourism Object Development

Responsibility for Tourism Destination Management

Sustainable tourism management in Sinjai Regency exemplifies strong integration among various organizations and community participation in creating attractive and sustainable destinations. The Tourism and Culture Office collaborates with village governments, the Tourism Awareness Group (Pokdarwis), tourism governance forums, and BUMdes to enhance local awareness of cultural and environmental values. Pokdarwis activities, including education and promotion via social media, enrich the tourist experience and foster a sense of ownership essential for sustainable tourism. Additionally, the DPC Tourism Awareness Community (Masata) in Sinjai Regency plays a pivotal role in formulating local tourism programs by leveraging maritime, cultural, and natural resources. Masata's commitment to collaborating with the government and focusing on the development of MSMEs and the creative economy demonstrates a holistic approach to tourism. This collaboration lays a strong foundation for Sinjai Regency to emerge as an attractive tourist destination at both regional and national levels. According to Cooper et al. (2005), four main attributes of a tourist destination are attractions, accessibility, amenities, and ancillaries.

Attractions are vital components that entice tourists, including natural beauty, local culture, and artificial sites. Accessibility, essential services such as accommodations, and ancillary services enhance the overall visitor experience. Increasingly, tourists, particularly millennials, demand digital destinations that leverage new technologies for environmental and community benefits. However, sustainable tourism requires innovative knowledge and policies to protect these destinations (Streimikiene et al., 2021). This includes limiting visitor numbers to safeguard the environment, which poses economic challenges as tourism heavily relies on visitor revenue (Go & Kang, 2023). In Panaikang Village, successful strategies based on local resources and multi-party collaboration highlight the potential for tourism to enhance community welfare.

Destination Management Strategy and Action Plan

Sustainable tourism management in Sinjai Regency can be significantly enhanced through effective online strategies, particularly by developing comprehensive websites and digital archives. An informative website serves as a central information hub for tourists and local communities, providing essential data on destinations, activities, and ongoing sustainability programs. By leveraging digital technology, information dissemination can occur rapidly and widely, thereby increasing public awareness and participation in tourism management. Additionally, digital archives that store historical data and evaluation reports from various

sustainable tourism initiatives facilitate long-term analysis and planning, promoting data-driven decision-making that aligns with community needs and aspirations. Visitor numbers at tourist attractions in Sinjai Regency from 2021 to 2024 illustrate tourism dynamics, revealing significant variations, with some sites experiencing increases while others face declines. These fluctuations directly impact local revenue (PAD) in the tourism sector. To enhance tourist appeal sustainably, strong collaboration among government, businesses, academia, and communities is essential, aligning with the Quintuple Helix perspective on stakeholder integration. The complete data can be seen in the following table:

Table 1. Realization of the Number of Tourists at Tourist Attractions Managed by the Sinjai Regency Tourism and Culture Office in 2021-2024

No.	Tourism Destination	Jan-Dec 2021	Jan-Dec 2022	Jan-Dec 2023	Jan-Nov 2024
1.	Batu Pake Gojeng Archaeological Park	9.827	9.972	7.768	4.726
2.	Lembang Saukang Waterfall	335	273	230	599
3.	Twin Waterfalls of Batu Barae	2.225	2.798	2.801	2.800
4.	National Forest Park (TAHURA)	8.858	8.068	8.463	4.900
5.	Tongke – Tongke Mangrove Forest	87.226	65.873	38.829	6.182
6.	Balangnipa Fortress	838	1.163	1.864	3.293
7.	Larea – Rea Island	15.539	2.394	2.827	1.190
Total		124.848	90.541	62.782	23.690

Source: Sinjai Regency Tourism and Culture Office, 2024

Table 2. Realization of the Number of Tourists at Tourist Attractions Managed by Villages/Sub-districts in Sinjai Regency in 2021-2024

No.	Tourism Destination	Village	Sub-district	2021	2022	2023	Jan-Nov 2024
1.	Karampuang Traditional House	Tompobulu	Bulupoddo	118	1.768	1.274	1.353
2.	Mallenreng Beach	Panaikang	Sinjai Timur	49.320	43.446	14.622	7.546
3.	Marannu Beach	Passimarannu	Sinjai Timur	5.010	10.225	34.333	21.200
4.	Bulu Lanceng	Baru	Sinjai Tengah	9.112	2.876	3.258	2.346
5.	Galung Village	Barania	Sinjai Barat	11.765	9.076	11.758	7.579
6.	Takkalala Mangrove Forest (HUBAT)	Sanjai	Sinjai Timur		35.358	16.405	11.738
7.	Eternal Beach	Bua	Sinjai Timur	-	-	-	19.980
8.	Blue Beach	Bua	Sinjai Timur	-	-	-	11.473
9.	Pattiro Tiroang Hill	Bonto Tengnga	Sinjai Borong	-	-	-	1.977

Source: Sinjai Regency Tourism and Culture Office, 2024

Table 3. The Realization of Local Original Income from Tourism Objects in Sinjai Regency in 2021-2024

No.	Tourism Destination	Jan-Dec 2021	Jan-Dec 2022	Jan-Dec 2023	Jan-Nov 2024
1	Batu Pake Gojeng Archaeological Park	Rp45.873.000	Rp38.471.000	Rp45.393.201	Rp25.897.900
2	Lembang Saukang Waterfall	Rp1.675.000	Rp765.000	Rp775.200	Rp2.372.000
3	Batu Barae Waterfall	Rp11.375.000	Rp15.705.000	Rp24.656.000	Rp22.442.000

4	National Forest Park (TAHURA)	Rp43.390.000	Rp282.400.000	Rp280.522.800	Rp43.557.000
5	Tongke – Tongke Mangrove Forest	Rp420.032.000	Rp40.569.000	Rp122.953.800	Rp199.814.000
6	Balangnipa Fortress	Rp1.246.000	Rp3.597.800	Rp5.422.600	Rp5.363.400
7	Larea -Rea Island	Rp4.720.000	Rp12.859.000	Rp17.853.000	Rp10.330.000
Total		Rp528.311.000	Rp394.366.800	Rp497.576.601	Rp309.776.300

Source: Sinjai Regency Tourism and Culture Office, 2024

Sustainable tourism development integrates efforts to enhance life quality by responsibly managing natural and cultural resources, emphasizing the balance between tourist needs and environmental sustainability while benefiting current and future generations. Stakeholder involvement, particularly from local communities, is crucial for effective management and respect for social culture authenticity. Investment in knowledge promotion encourages innovation aligned with environmental conservation, making quality management key to developing sustainable skills (Carayannis et al., 2012). Success in this area relies on a strong political subsystem that facilitates stakeholder interaction across education, social, and environmental fields. Cooperation and knowledge sharing are vital, especially in tackling climate change and promoting sustainable development. A holistic approach ensures the tourism sector provides economic benefits while preserving culture and the environment (Zen & Shibakawa, 2022). The natural environment significantly enhances tourist attraction appeal, yet tourism activities can have negative impacts requiring attention. Preservation and development of sites are essential for driving tourist arrivals (Kirom et al., 2016). An initiative by Muhammadiyah's students at Marannu Beach demonstrates a commitment to sustainability, involving collaboration with local government and youth organizations to tackle environmental challenges through waste cleanup and mangrove planting, fostering student awareness and collaboration in societal change.

Roles and Framework of actors in the Quintuple Helix perspective

The quintuple helix model is an innovative approach that emphasizes transforming modern societies and economic systems into a sustainable global framework (Andryeyeva et al., 2020). Communities play a central role in managing village tourism, maintaining local values that attract tourists, including social and cultural elements. Civil society's involvement in the innovation system is crucial for supporting broader transformation, influencing behavior,

technological development, production patterns, and existing values and norms. Community participation in regional policy documents significantly contributes to development sustainability (Grundel & Dahlström, 2016). The friendly nature and interpersonal skills of local residents near tourist attractions foster sustainable tourism (Gautam, 2023), while equitable wealth distribution from tourism enhances local support and ownership (dos Santos et al., 2024). However, challenges exist, such as community unpreparedness, competition between attractions, lack of partnerships, and ineffective promotion. Supporting factors like community involvement, adequate funding, natural beauty, and complete infrastructure are essential. An inclusive, community-based approach is crucial for achieving sustainable tourism development that benefits everyone involved, relying on active local involvement and participation in tourism activities, influenced by community knowledge and education.

Government Helix

Strong collaboration among various stakeholders, particularly the government, is essential for fostering innovation in tourism management, especially in uncertain situations (Rodrigues-Ferreira et al., 2023). The government helix is pivotal in creating a supportive relationship that encourages economic measures contributing to socio-economic and sustainable development. High-quality democracy advances knowledge and innovation, crucial for achieving sustainable development goals (Carayannis & Campbell, 2011). For example, the collaboration between the Sinjai Regency Tourism and Culture Office and PT Jasa Raharja in providing tourist insurance is a strategic move that supports sustainable tourism. With an affordable premium, this program enhances security for visitors to attractions like the Tongke-Tongke Mangrove Forest and Batu Barae Twin Waterfalls, potentially increasing tourist numbers. It also strengthens Sinjai Regency's image as a secure tourist destination, promoting economic growth and cultural preservation.

The Sinjai Regency Government's commitment to advancing tourism is evident through initiatives like city branding with the tagline "Ayo ke Sinjai." This strategy introduces tourism icons, natural beauty, culinary specialties, and the creative economy, supported by a theme song targeting millennials. The government's collaboration with the private sector in managing tourist villages and leading destinations has spurred positive developments, with effective online promotions using #ayokesinjai. This approach reinforces regional tourism identity, boosting tourist visits and fostering local economic growth (Rosalia & Zainal, 2021). To enhance innovation and hygiene standards, the Sinjai Regency Tourism and Culture Office conducted intensive training for culinary business actors under the theme "Cultivated Sinjai, Successful Tourism." Sustainable management of tourist attractions is emphasized, focusing on efficient resource use, ecosystem protection, and local community empowerment. Government-led governance involves multiple stakeholders to assess environmental and social impacts, implementing a monitoring system for long-term sustainability. Training for tour guides aims to enhance tourist experiences and preserve cultural heritage, creating a tourism ecosystem that benefits the economy while respecting cultural values.

Academic Helix

In Sinjai Regency, particularly Pulau Sembilan District, sustainable tourism development is enhanced by the academic helix through the Marine Department of FIKP Hasanuddin University's community service program. They have formulated a marine tourism concept on Larea-rea Island, increasing tourist attractions and empowering local communities through discussions, resource mapping, and education. Appreciation from the Sinjai Tourism Office highlights the commitment to promoting attractions that benefit both the economy and environment, emphasizing the role of academic collaboration in sustainable tourism.

The Thematic Community Service Program (KKNT) of Hasanuddin University showcases the academic helix's role in developing sustainable tourism in Sinjai Regency. Student involvement in projects like the Tongke-Tongke Mangrove Forest illustrates how education and practice enhance public awareness of sustainability. Collaborating with the Tourism Office, academics act as change agents, encouraging community participation in preserving local resources. The Sinjai Regency Government's partnership with the Makassar Tourism Polytechnic through an MoU represents

a strategic step emphasizing education and human resource training. By prioritizing the tridharma of higher education—education, research, and community service—this initiative enhances local capacity in tourism, highlighting the importance of academic involvement in supporting innovation.

Training programs aim to improve skills among employees and destination managers, building a strong foundation for sustainable tourism management essential for regional competitiveness. By applying the Quintuple Helix model, digital marketing training enhances understanding of information technology and marketing strategies, fostering collaboration among participants and stakeholders. Collaboration between local governments and academics supports professional and sustainable tourism development, aligning with modern market demands. The Ecotourism Tour Guide training, organized by the Tourism and Culture Office in collaboration with the Ministry of Tourism and Creative Economy, reflects a commitment to enhancing human resource capacity. This initiative not only boosts Sinjai Regency's tourist appeal but also empowers local communities, promoting environmentally friendly tourism. Academic involvement is key in influencing tourism development, infrastructure, and resource utilization, highlighting the need for innovation and adaptability to sustain cultural and natural resources.

Business Actors Helix

Sustainable tourism development requires a holistic approach where cooperation among various elements in the tourism ecosystem is crucial. Local businesses play a key role in building sustainable tourism, providing not only economic benefits but also social, environmental, and cultural advantages (MacKenzie & Gannon, 2019). The involvement of business actors is essential in driving innovation and investment, ensuring that tourism initiatives are both profitable and sustainable. Collaboration among helixes, including government, private sector, academics, communities, and the environment, is essential for supporting regional tourism (Hardianto et al., 2019). The quintuple helix model emphasizes democracy and ecology, highlighting that synergy among universities, industry, government, and society, supported by media and environmental considerations, can enhance human resource capabilities and the competitiveness of small and medium enterprises (SMEs) (Susanti & Pradana, 2021)

A concrete example of this synergy is the wastra design competition at the Tongke-Tongke Festival, which acts as a creative platform to preserve and promote Indonesian culture through traditional fabrics. With participation from 16 individuals across various regions, it reflects widespread interest and potential for intercultural collaboration. The involvement of academics and cultural observers lends credibility to the judging process, producing high-quality and relevant works. Proposing the winning design as a regional wastra is a strategic move to develop sustainable tourism, strengthen cultural identity, and enhance tourist appeal. Sinjai Regency, with its diverse landscape and rich resources, holds potential to improve community welfare through planned local economic development, particularly by developing mountain villages as agro-tourism sites and utilizing coastal fishery resources. The success of these initiatives relies on the institutional strength of Village-Owned Enterprises (BUMDes), emphasizing the need to enhance manager capacity. Business actors play a pivotal role in providing expertise and resources to efficiently manage tourism and agribusiness, maximizing local economic benefits sustainably. The Minister of Villages has highlighted the importance of tourist villages in national economic recovery, focusing on natural potential and conservation. With effective management, these villages can attract visitors and boost the local economy, supported by the Ministry's initiative to promote them through the Nusantara Tourism Village application, ensuring responsible and sustainable tourism at the village level.

Civil Society Helix

The Regent of Sinjai Regency has encouraged village heads to fully develop tourist villages, recognizing the untapped potential in these areas. To support this initiative, the Tourism and Culture Office launched the 'Tourism Awareness Movement and Sapta Pesona Action' at Mallenreng Beach. This program aims to enhance public awareness in managing tourist areas and protecting the environment, fostering a positive tourism climate. A successful example is the Barania Tourism Village, which won First Place in the 2022 Indonesian Tourism Village Awards (ADWI) for the Cleanliness, Health, Safety, and Environment Sustainability (CHSE) category. This achievement reflects the dedication of the community in transforming the village into a sustainable tourist destination, which is anticipated to boost the local economy through job creation. The Ministry of Natural Resources and Environment's selection process highlights the importance of institutions, attractions,

infrastructure, and quality services. The success of tourist villages like Barania relies on commitment, competence, and champions, as well as leveraging local social, economic, and cultural potential.

Community involvement through tourism awareness groups enhances local participation, promoting cultural heritage and environmental preservation. The local government plays a crucial role in formulating policies that support sustainable tourism and providing necessary infrastructure. Support from local and national media in promoting Sinjai Regency's tourism image significantly attracts visitors. This integrated approach enables Sinjai Regency to become an appealing destination while ensuring social and environmental sustainability. Digital technologies, such as apps, assist tourists in planning their trips, aligning economic goals with environmental sustainability (Sgroi & Modica, 2024). However, challenges remain in achieving community well-being and sustainable impacts (Saarinen, 2019). Effective synergy among all tourism stakeholders is essential for enhancing community welfare and environmental preservation. The establishment of the Tourism Information Center (TIC) at the Public Service Mall exemplifies this collaboration, improving service standards and attracting tourists. Benchmarking against Bali underscores the importance of knowledge transfer in developing tourism villages, driving local economies, and empowering communities through education and outreach programs focused on environmental and cultural preservation.

In Sinjai Regency, sustainable tourism development emphasizes a destination management action plan that actively engages local communities, government, the private sector, and academia to ensure environmental sustainability and enhance tourist services. A notable collaboration is the Camp and Greenery activities by the Sinjai Student Family of Ujung Pandang State Polytechnic at Pasimarannu Beach, where mangrove tree planting aids ecosystem restoration and educates the community on natural resource management. This initiative highlights the synergy essential for sustainable environmental conservation and aims to inspire future actions. From a quintuple helix perspective, tourism development incorporates five elements: government, industry, community, environment, and education, addressing not only economic factors but also social and environmental sustainability. Implementing a transparent action plan encourages community participation in decision-making, fostering ownership and responsibility. Collaboration among universities, government, and civil society can lead to social innovations that enhance community welfare and

develop attractive, environmentally responsible tourism (Kitsios et al., 2021; Morawska-Jancelewicz, 2022).

Environmental Helix

Sustainable tourism development has become increasingly vital in addressing the complex environmental and social challenges of our time. It underscores the necessity for meticulous planning that considers environmental impacts and potential barriers. Intensive and continuous collaboration among various stakeholders—including government entities, local communities, and the private sector—is essential for building the trust and commitment required to cultivate leading tourism destinations. This perspective aligns with the views of Tamrin et al. (2023), who emphasize the importance of environmental preservation in tandem with tourism development, thereby creating a harmonious balance between economic growth and environmental sustainability.

The quintuple helix framework highlights the significance of effective collaboration among diverse actors, including government, communities, academia, industry, and media, as crucial for sustainable tourism development (Hartanto et al., 2021). Principles of sustainable tourism increasingly prioritize the conservation of natural resources and the environment. Local governments must concentrate on enhancing human resource capacity and engaging policymakers in the implementation of eco-friendly strategies. Innovative practices in natural resource management are essential for boosting

tourism competitiveness while ensuring alignment with environmental conservation efforts. A concrete example is the mangrove tree planting initiative in Sinjai Regency, which involved local officials, military personnel, students, and community members to foster awareness about nature conservation and coastal protection. Integrating this initiative into cultural festivals strengthens the connection between environmental conservation and tourism promotion. Regular tree planting efforts aim to transform Hubat Beach into a safe and attractive tourist destination, exemplifying successful sustainable resource management. This initiative not only enhances the area's tourism appeal but also supports local economic development by creating jobs and promoting community involvement, thereby fostering a sustainable tourism ecosystem that benefits both the environment and the local population.

In the context of sustainable tourism development, understanding the roles and framework of actors in the Quintuple Helix perspective is very important. This approach emphasizes collaboration between various stakeholders: government, tourism business/industry actors, academics, communities, and the environment, to improve tourism attractiveness. The following table summarizes the contribution of each actor in sustainable tourism development, based on research data analysis. This table provides comprehensive insight into the dynamics of interactions between actors, as well as their implications for tourism sustainability and attractiveness.

Table 4. Quintuple Helix actor roles and framework

Quintuple Helix	Role	Actor Framework
Government	Policies, Regulations, and Infrastructure	Funding and Management Training
Sinjai Regency Regional Government, Ministry of Tourism and Creative Economy, Ministry of Villages, Development of Disadvantaged Regions and Transmigration, Village Government	<ol style="list-style-type: none"> 1. The government has an important role in formulating regulations and policies that govern the development of sustainable tourism, in order to support the management of tourist attractions in Sinjai Regency. 2. The regional government and village government are committed to developing infrastructure that supports accessibility and comfort for tourists, so that it can increase the attractiveness of tourist destinations. 	<ol style="list-style-type: none"> 1. The regional government and village government allocate funds for the development of tourist attractions managed by the Tourism Office and support the development of tourist villages. 2. The government organizes training for tourist attraction managers on best practices in sustainable tourism management.
Business actors/ Tourism industry	Tourism Product Development and Service Innovation	Partnership with government and companies

Badan Usaha Milik Desa (BUMDes), PT. Jasa Raharja	<ol style="list-style-type: none"> 1. Business actors develop environmentally friendly tourism products. 2. The actor attended training for tourism managers on best practices in sustainable tourism management. 	<ol style="list-style-type: none"> 1. Business actors work together with the government, tourism managers, and tourism village communities to develop attractive and sustainable tourism destinations 2. Business actors improve the tourist experience and maintain environmental sustainability and tourist protection
Academics	Research, Education, and Training	Research Collaboration, Workshops, and Seminars
Universitas Hasanuddin, Universitas Muhammadiyah Sinjai, Institut Agama Islam Muhammadiyah (IAIM) Sinjai, Politeknik Negeri Ujung Pandang, Politeknik Pariwisata Makassar	<ol style="list-style-type: none"> 1. Academics conduct studies on the impact of tourism on the environment and natural resource management. 2. Academics develop educational programs that focus on the implementation of sustainable tourism practices. 	<ol style="list-style-type: none"> 1. Academics work with government and tourism managers to conduct relevant research in the development of the tourism sector. 2. Academics organize training and seminars for tourism managers on innovation and sustainability.
Civil Society	Active Participation and Environmental Awareness	Discussion Forum and Educational Program
Tourism Awareness Group (Pokdarwis), Tourism Awareness Community (Masata)	<ol style="list-style-type: none"> 1. Local communities play an active role in the management and development of tourist attractions. 2. The community forms groups that function to increase tourist awareness regarding the importance of sustainability in the tourism sector. 	<ol style="list-style-type: none"> 1. The community participates in governance forums to discuss tourism issues and provide input to the government and tourism managers. 2. The governance forum organizes educational programs on sustainable tourism for visitors.
Environment	Conservation of Natural Resources and Tourist Attractions	Good Environmental Management and environmental awareness
Nature Tourism, Marine Tourism, and Cultural Tourism	<ol style="list-style-type: none"> 1. Conservation of natural resources is a key factor in the development of sustainable tourism objects and in maintaining natural attractions. 2. Natural beauty and environmental cleanliness serve as the main attractions for tourists. 	<ol style="list-style-type: none"> 1. Government, academics, business actors, and civil society collaborate in implementing sustainable environmental management practices in tourism development. 2. All stakeholders play a role in raising awareness of the importance of environmental conservation among tourists and the community.

Source: Processed Research Data Results (2024)

Tourism development aims to promote attractions that can economically, socially, and culturally benefit the community. However, sustainable tourism development must ensure the responsible preservation of natural, social, and cultural resources. In Sinjai Regency, the development of sustainable tourism necessitates a nuanced understanding of the complex interactions between the natural environment and social structures. The quintuple helix model, which integrates academia, industry, government, civil society, and the natural environment, provides a holistic framework for analyzing these

dynamics (König et al., 2020). A strong synergy between local governments managing tourist attractions and communities involved in tourism village management is crucial for enhancing tourist appeal, especially in light of fluctuations in visitor numbers that underscore the need for sustainable innovations responsive to market dynamics and tourist preferences.

Collaboration among various stakeholders, including higher education institutions in South Sulawesi, can drive innovation in tourism development. Academic institutions can contribute through research and sustainability-

focused programs, while the industrial sector, such as PT Jasa Raharja, can offer financial support and infrastructure improvements. This knowledge can inform best practices for environmentally friendly tourism management, aligning with the principles of sustainable development that balance economic growth and environmental protection (Carayannis & Campbell, 2010). Additionally, civil society's participation is vital within the Quintuple Helix perspective. Empowering local communities to actively engage in the development of tourism villages in Sinjai Regency can lead to authentic and appealing tourism products. The ability to adapt to environmental conditions and community needs is essential for fostering sustainable innovation and enhancing regional economic competitiveness (Firmansyah et al., 2022).

The quintuple helix model emphasizes the interaction between society and nature within the innovation ecosystem, founded on green knowledge, green growth, and social ecology (Cai, 2022; Kunwar & Ulak, 2024). This model facilitates the integration of various stakeholders, promoting a holistic approach to tourism that considers socio-cultural and environmental aspects. By fostering collaboration among government, academia, industry, and local communities, sustainable tourism can drive economic growth while preserving cultural heritage and ecological integrity. In the context of Sinjai Regency, the active involvement of local governments, academic institutions, business actors, civil society, and the natural environment is essential for creating a sustainable tourism ecosystem. This inclusive approach ensures that tourist attractions in Sinjai Regency are appealing to visitors while providing long-term benefits for local communities and environmental sustainability.

CONCLUSION

This study concludes that the quintuple helix approach significantly influences the development of sustainable tourism destinations in Sinjai Regency. By fostering collaboration among government, academia, business entities, civil society, and the environment, this model enhances the tourism ecosystem through synergistic relationships. To optimize development, innovations in facilities surrounding tourist attractions, such as accommodations, accessibility, and supporting services, are essential. Additionally, addressing challenges like inadequate infrastructure and competition from privately managed destinations is crucial for effective tourism growth.

Sustainable management practices must prioritize the preservation of biodiversity and natural resources, positively impacting both the local ecosystem and community businesses. Effective tourism development not only boosts the local economy but also improves residents' welfare, making stakeholder cooperation and local capacity building vital for success. The implications suggest that the quintuple helix model can serve as a viable framework for sustainable tourism in similar regions. Future research should investigate the economic, social, and environmental effects of sustainable tourism to provide evidence-based recommendations for enhancing the quality of life for local communities while ensuring environmental sustainability.

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REFERENCES

- Amrial, A., Muhamad, E., & Adrian, A. M. (2017). Penta helix model: A sustainable development solution through the industrial sector. *Social and Human Sciences*, 14(1), 152–156.
- Andryeyeva, N., Tiutiunnyk, H., Burkynskyi, B., Khumarova, N., & Kupinets, L. (2020). Methodological approach of investment and innovation regional environmental policy using the smart specialization and quintuple helix models. *Economics and Environment*, 74(3), 28.
- Barcellos-Paula, L., De la Vega, I., & Gil-Lafuente, A. M. (2021). The Quintuple Helix of innovation model and the SDGs: Latin-American countries' case and its forgotten effects. *Mathematics*, 9(4), 416.
- Cai, Y. (2022). Neo-Triple Helix model of innovation ecosystems: integrating Triple, Quadruple and Quintuple Helix models. *Triple Helix*, 9(1), 76–106.
- Carayannis, E. G., Barth, T. D., & Campbell, D. F. J. (2012). The Quintuple Helix innovation

- model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, 1, 1–12.
- Carayannis, E. G., & Campbell, D. F. J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other?: a proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, 1(1), 41–69.
- Carayannis, E. G., & Campbell, D. F. J. (2011). Open innovation diplomacy and a 21st century fractal research, education and innovation (FREIE) ecosystem: building on the quadruple and quintuple helix innovation concepts and the “mode 3” knowledge production system. *Journal of the Knowledge Economy*, 2, 327–372.
- Carayannis, E. G., Cherepovitsyn, A. E., & Ilinova, A. A. (2017). Sustainable development of the Russian arctic zone energy shelf: the role of the quintuple innovation helix model. *Journal of the Knowledge Economy*, 8, 456–470.
- Cooper, C., Fletcher, J., Fyall, A., Gilbert, D., & Wanhill, S. (2005). *Tourism: Principles and practice* (3rd ed.). Pearson education.
- dos Santos, E. R. M., Pereira, L. N., Pinto, P., Boley, B. B., & Ribeiro, M. A. (2024). Imperialism, empowerment, and support for sustainable tourism: Can residents become empowered through an imperialistic tourism development model? *Tourism Management Perspectives*, 53, 101270.
- Durán-Romero, G., López, A. M., Beliaeva, T., Ferasso, M., Garonne, C., & Jones, P. (2020). Bridging the gap between circular economy and climate change mitigation policies through eco-innovations and Quintuple Helix Model. *Technological Forecasting and Social Change*, 160, 120246.
- Firmansyah, D., Suryana, A., Rifa'i, A. A., Suherman, A., & Susetyo, D. P. (2022). Hexa helix: kolaborasi quadruple helix dan quintuple helix innovation sebagai solusi untuk pemulihan ekonomi pasca covid-19. *EKUITAS (Jurnal Ekonomi Dan Keuangan)*, 6(4), 476–499.
- Gautam, V. (2023). Why local residents support sustainable tourism development? *Journal of Sustainable Tourism*, 31(3), 877–893.
- Go, H., & Kang, M. (2023). Metaverse tourism for sustainable tourism development: Tourism agenda 2030. *Tourism Review*, 78(2), 381–394.
- Grundel, I., & Dahlström, M. (2016). A quadruple and quintuple helix approach to regional innovation systems in the transformation to a forestry-based bioeconomy. *Journal of the Knowledge Economy*, 7, 963–983.
- Hardianto, W. T., Sumartono, Muluk, M. R. K., & Wijaya, F. (2019). PentaHelix synergy on tourism development in Batu, East Java. *International Journal of Innovation, Creativity and Change*, 10(6).
- Hartanto, W., Ani, H. M., Suharso, P., Sedyati, R. N., & Mardiyana, L. O. (2021). Quintuple helix model for tourism development in Banyuwangi regency. *IOP Conference Series: Earth and Environmental Science*, 747(1), 12077.
- Herliana, S., & Qorina, S. (2024). The role of quintuple helix on halal-tourism ecosystem in Indonesia. *Proceeding International Conference on Accounting and Finance*, 1087–1096.
- Khizar, H. M. U., Younas, A., Kumar, S., Akbar, A., & Poulouva, P. (2023). The progression of sustainable development goals in tourism: A systematic literature review of past achievements and future promises. *Journal of Innovation & Knowledge*, 8(4), 100442.
- Kirom, N. R., Sudarmiatin, S., & Putra, I. W. J. A. (2016). *Faktor-faktor penentu daya tarik wisata budaya dan pengaruhnya terhadap kepuasan wisatawan*. State University of Malang.
- Kitsios, F., Kamariotou, M., & Grigoroudis, E. (2021). Digital entrepreneurship services evolution: analysis of quadruple and quintuple helix innovation models for open data ecosystems. *Sustainability*, 13(21), 12183.
- König, J., Suwala, L., & Delargy, C. (2020). Helix models of innovation and sustainable development goals. In *Industry, innovation and infrastructure. Encyclopedia of the UN sustainable development goals* (pp. 1–15). Berlin, Heidelberg: Springer.
- Kunwar, R. R., & Ulak, N. (2024). Extension of the Triple Helix to Quadruple to Quintuple Helix Model. *Journal of APF Command and Staff College*, 7(1), 241–280.
- MacKenzie, N., & Gannon, M. J. (2019). Exploring the antecedents of sustainable tourism development. *International Journal of Contemporary Hospitality Management*, 31(6), 2411–2427.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook*. SAGE Publication,

- Inc.
- Mineiro, A. A. da C., Assis de Souza, T., & Carvalho de Castro, C. (2021). The quadruple and quintuple helix in innovation environments (incubators and science and technology parks). *Innovation & Management Review*, 18(3), 292–307.
- Morawska-Jancelewicz, J. (2022). The role of universities in social innovation within quadruple/quintuple helix model: Practical implications from polish experience. *Journal of the Knowledge Economy*, 13(3), 2230–2271.
- Nanda, W. D., Widianingsih, I., & Miftah, A. Z. (2023). The linkage of digital transformation and tourism development policies in Indonesia from 1879–2022: Trends and implications for the future. *Sustainability*, 15(13), 10201.
- Palazzo, M., Gigauri, I., Panait, M. C., Apostu, S. A., & Siano, A. (2022). Sustainable tourism issues in European countries during the global pandemic crisis. *Sustainability*, 14(7), 3844.
- Rodrigues-Ferreira, A., Afonso, H., Mello, J. A., & Amaral, R. (2023). Creative economy and the quintuple helix innovation model: a critical factors study in the context of regional development. *Creativity Studies*, 16(1), 158–177.
- Rosalia, F., & Zainal, A. G. (2021). Genpi's strategy in the development digital tourism destination in Lampung Province. *Sosiohumaniora*, 23(2), 177–186.
- Saarinen, J. (2019). Communities and sustainable tourism development: Community impacts and local benefit creation in tourism. In *A research agenda for sustainable tourism* (pp. 206–222). Edward Elgar Publishing.
- Safaa, L., Atalay, A., Makutėnienė, D., Perkumienė, D., & Bouazzaoui, I. El. (2023). Assessment of carbon footprint negative effects for nature in international traveling. *Sustainability*, 15(16), 12510.
- Sgroi, F., & Modica, F. (2024). Digital technologies for the development of sustainable tourism in mountain areas. *Smart Agricultural Technology*, 8, 100475.
- Streimikiene, D., Svagzdiene, B., Jasinskas, E., & Simanavicius, A. (2021). Sustainable tourism development and competitiveness: The systematic literature review. *Sustainable Development*, 29(1), 259–271.
- Sulistiyadi, Y., Eddyono, F., & Entas, D. (2021). *Indikator Perencanaan Pengembangan Pariwisata Berkelanjutan*. CV. Anugrah Utama Raharja.
- Sumarto, R. H., Sumartono, S., Muluk, M. R., & Nuh, M. (2020). Penta-Helix and Quintuple-Helix in the management of tourism villages in Yogyakarta City. *Australasian Accounting, Business and Finance Journal*, 14(1), 46–57.
- Susanti, H. D., & Pradana, D. A. (2021). Implementation of quintuple helix in the development and improvement of SMEs competitiveness in Banyuwangi regency. *Britain International of Humanities and Social Sciences (BIOHS) Journal*, 3(1), 232–241.
- Tamrin, M. H., Raharja, W. T., & Salmon, and I. P. P. (2023). Collaborative Governance In Managing Marine Ecotourisms: A Case Study At Klayar Beach, Pacitan Regency, Indonesia. *Sosiohumaniora: Jurnal Ilmu-Ilmu Sosial Dan Humaniora*, 25(3), 369–378.
<https://doi.org/https://doi.org/10.24198/sosiohumaniora.v25i3.35319>
- Taylor, S. J., Bogdan, R., & DeVault, M. L. (2015). *Introduction to qualitative research methods: A guidebook and resource*. John Wiley & Sons.
- Yuanitasari, D., Sardjono, A., & Susetyo, H. (2024). Legal Perspective: Msmes As A Support System For Halal Industry In Fulfilling Sustainable Development Goals In Indonesia. *Sosiohumaniora: Jurnal Ilmu-Ilmu Sosial Dan Humaniora*, 26(2), 213–224.
<https://doi.org/https://doi.org/10.24198/sosiohumaniora.v26i2.50597>
- Zen, I. S., & Shibakawa, H. (2022). Quintuple Helix Lens for transformation: an Okayama model of education for sustainable development. *Frontiers in Sustainability*, 3, 798330.