

Chapter 46

Prototype of the Sustainable Tourism Promotion Model Based on Technology 4.0 in Post-conflict Regions. Case Study: La Palma and Yacopí (Colombia)

Melva Inés Gómez-Caicedo^{1*}, Vladimir Ballesteros Ballesteros¹,
Óscar Alberto Villalba Pulido², Eduardo Garzón Lombana¹,
María Eugenia López Londoño¹, and Ana Milena Luengas Alarcón¹

¹Fundación Universitaria Los Libertadores, Bogotá, Colombia

²Secretaría de Ciencia, Tecnología e Innovación, Gobernación de Cundinamarca, Bogotá, Colombia

Abstract

The creation of sustainable cities and smart territories is an initiative that has been gaining importance in recent years. The prototype presented in this document is the result of a project entitled ‘Development of a Model for Sustainable Tourism Promotion using Technology 4.0 in the municipalities of La Palma and Yacopí in the department of Cundinamarca’, which aimed to develop a Model for Sustainable Tourism Promotion using Technology 4.0 in post-conflict regions through the application of immersive technologies. To this end, three pilot phases were developed, involving the community of the municipalities of La Palma and Yacopí (Cundinamarca, Colombia) in the survey of tourism offerings and the creation of a Sustainable Tourism Promotion Model, which facilitated the incorporation of technological elements for the recognition of the territory. The prototype created is an integrative model of the dimensions of sustainability, making it a process that can be applied in other territories. Finally, the importance of the project for territorial development, sustainable local promotion, and community-centred social innovation is highlighted, emphasising the value of collaborative work with local communities, tourism sector actors, and public authorities as a fundamental condition for ensuring its capacity to promote the economic, social, and cultural development of the regions.

Keywords: *Sustainable Tourism, Model, Technology, Community, Development*

Introduction

Tourism is one of the economic activities that contributes to regional development¹, promotes recognition of territories, their culture and traditions, and facilitates the creation of businesses in the regions.

¹Mehdi Nooripoor et al., “The Role of Tourism in Rural Development: Evidence from Iran,” *GeoJournal* 84, no. 4 (2021): 1705–19, <https://www.jstor.org/stable/48754283>.

The World Tourism Organisation (UNWTO) states that tourism leads to increased Gross Domestic Product (GDP), job opportunities, higher incomes, and, as a result, increased demand for products and services².

However, in order to respond to new global trends and prevent damage to regions as a result of tourism activity³, territories are facing a variety of situations that are leading them to propose revitalisation strategies⁴ that incorporate elements related to sustainable tourism from social, environmental and economic dimensions and integrate innovative processes that emerge through research.

When regions have been victims of armed conflict, the challenges are even greater⁵. This is due to the need to incorporate tourism promotion strategies that highlight their social, cultural, historical, environmental, and economic benefits and characteristics⁶, while seeking to mitigate the negative image that may persist about these territories.

This document presents the results obtained from the Development of a Sustainable Tourism Promotion Model based on Technology 4.0 in post-conflict regions, from which a prototype for the recognition and development of territories has emerged. To this end, the study is based on the initiative proposed in 2021 within the framework of Call 13 of the General Royalties System, which was developed between 2022 and 2024 by the Secretariat of Science, Technology and Innovation of the Government of Cundinamarca and the Los Libertadores University Foundation, with the aim of increasing mechanisms for the promotion of sustainable tourism through innovation and technology in regions that have been so affected by violence: the case of the municipalities of La Palma and Yacopí.

In this regard, the prototype identifies strategies to promote tourism by implementing technological tools and incorporating augmented and virtual reality elements into the processes. These mechanisms favour the recognition, symbolic reconstruction and re-signification of the territory.

Results and Discussion

In various regions of the world, violence has left deep scars, generating negative consequences in economic, social, and environmental spheres. Colombia is one of the countries that have been victims

²"*Tourism and Travel-related Services*," World Trade Organization, accessed August 13, 2025, https://www.wto.org/english/tratop_e/serv_e/tourism_e/tourism_e.htm; Johan Ricardo Alonso Rodríguez, "El turismo como motor de crecimiento económico en Colombia (2000-2019): Tourism as an engine of economic growth in Colombia (2000-2019)," *Revista Internacional de Turismo, Empresa y Territorio* 6, no. 1 (2022): 57–83, <https://doi.org/10.21071/riturem.v6i1.14056>.

³Ulrika Persson-Fischer and Shuangqi Liu, "The Impact of a Global Crisis on Areas and Topics of Tourism Research," *Sustainability* 13, no. 2 (2021): 906, <https://doi.org/10.3390/su13020906>.

⁴Franz Tödting et al., "New Directions for RIS Studies and Policies in the Face of Grand Societal Challenges," *European Planning Studies* 30, no. 11 (2022): 2139–56, <https://doi.org/10.1080/09654313.2021.1951177>.

⁵Alexandra Huneus and Pablo Rueda Sáiz, "Territory As a Victim of Armed Conflict," *International Journal of Transitional Justice* 15, no. 1 (2021): 210–29, <https://doi.org/10.1093/ijtj/ijab002>.

⁶Zhizhang Zhao, "Tourism Development and Marketing Strategies in Emerging Markets," *Tourism Management and Technology Economy* 6, no. 7 (2023): 26–32, <http://dx.doi.org/10.23977/tmte.2023.060704>.

of these events for more than 60 years. Cundinamarca, a department with 116 municipalities spread across 15 provinces, possesses a wealth of tourist attractions and biodiversity. This presents a strategic opportunity to develop initiatives that promote tourism and support the region's economic growth. However, some of its municipalities have been affected by situations of violence generated by illegal groups. This is the case of La Palma and Yacopí, two territories located in the Province of Rionegro, which, despite their natural, cultural, social, and economic resources, were affected by violent acts that limited their development.

This situation has led to the need for initiatives that promote responsible recognition of the territory. Therefore, in 2021, as part of Call No. 13 of the General Royalties System, a project was proposed titled: 'Development of a Model for Sustainable Tourism Promotion using Technology 4.0 in the municipalities of La Palma and Yacopí, in Cundinamarca.' This project has helped strengthen sustainable, responsible, and inclusive tourism, emphasizing that activities in this sector become central to actions related to sustainable development. It involves the community and incorporates Industry 4.0 technologies, enhancing the visitor experience, promoting territory recognition, and facilitating the dissemination of activities.

These increasingly accessible technologies have proven their effectiveness in areas such as education, culture, and tourism promotion through immersive content and interactive experiences. In the case of the municipalities of La Palma and Yacopí, their implementation seeks not only to raise the profile of existing tourism offerings but also to contribute to processes of historical memory, social appropriation of the territory, and local economic reactivation.

Likewise, the development of different phases that gave rise to the first model of sustainable tourism promotion, which can be replicated across regions, stands out. Its results represent a commitment to the community's economic development, allowing the articulation of the different actors that are part of the country's productive ecosystem. This has led to a prototype that serves as an integrative mechanism for generating actions to recognise the territory, develop good tourism practices, manage sustainability-related processes, and contribute to the region's growth.

This has given rise to a prototype conceived as an integrating mechanism, aimed at generating actions for the recognition of the territory, promoting good practices in tourism, strengthening the management of processes related to sustainability, and contributing to the growth of the region.

Actions Taken to Develop the Prototype

The project entitled 'Development of a Sustainable Tourism Promotion Model based on Technology 4.0 in the municipalities of La Palma and Yacopí in the department of Cundinamarca' was developed from 2022 onwards by the Secretariat of Science, Technology and Innovation of the Government of Cundinamarca and the Los Libertadores University Foundation in three stages, which were fundamental for the creation of the integrative prototype:

Stage 1. Characterisation of tourism products in the municipalities of La Palma and Yacopí

The characterisation of tourist attractions was carried out according to the methodology guide for the preparation of the inventory of tourist attractions of the Colombian Vice-Ministry of Tourism. This

process was supported and participated in by the municipal councils of La Palma and Yacopí, tourism stakeholders and operators, and the community.

In this stage, the tourist products of the municipalities of La Palma and Yacopí were identified.

- Identify natural, tangible, and intangible cultural tourist attractions
- Identify tourist facilities
- Identify support infrastructure
- Identify superstructure

Stage 2. Creation of spaces for citizen participation in the co-creation of the Sustainable Tourism Promotion Model design

During this process, various activities were carried out to raise awareness of the importance of tourism. These included organising round tables with the community, stakeholders, and operators in the sector, as well as with municipal officials. These sessions yielded valuable material that served as input for the formulation of the sustainable tourism promotion model.



Figure 1: Activities carried out with the community.

In addition, the project contributed to local empowerment, recognising the importance of caring for the territory in relation to the tourist activities generated once the region's tourist attractions, customs, culture, and economy have been promoted. As a result of territorial cohesion, the Association of Sustainable Tourism for La Palma (ASOTURISPAL) and the La Ruta Minera de Yacopí Tourism Association were created.

Stage 3. Development of an information management tool to promote the Sustainable Tourism Promotion Model

Based on the information obtained, a prototype of the Sustainable Tourism Promotion Model was created, from which two websites and two apps (one for each municipality) were generated, incorporating elements of augmented and virtual reality in order to disseminate information about the municipalities: their natural attractions, gastronomic offerings, places of interest, tourist services, service providers, existing service networks, and relevant information on sustainability.

The web pages compile information that allows tourism service providers and the community to highlight the benefits of their municipality and promote and publicise their territory. At the same time, they are an essential source of information for visitors, who can learn about the municipalities' characteristics and attractions before their visit. The web pages feature videos of the territory and testimonials from the municipality's inhabitants.

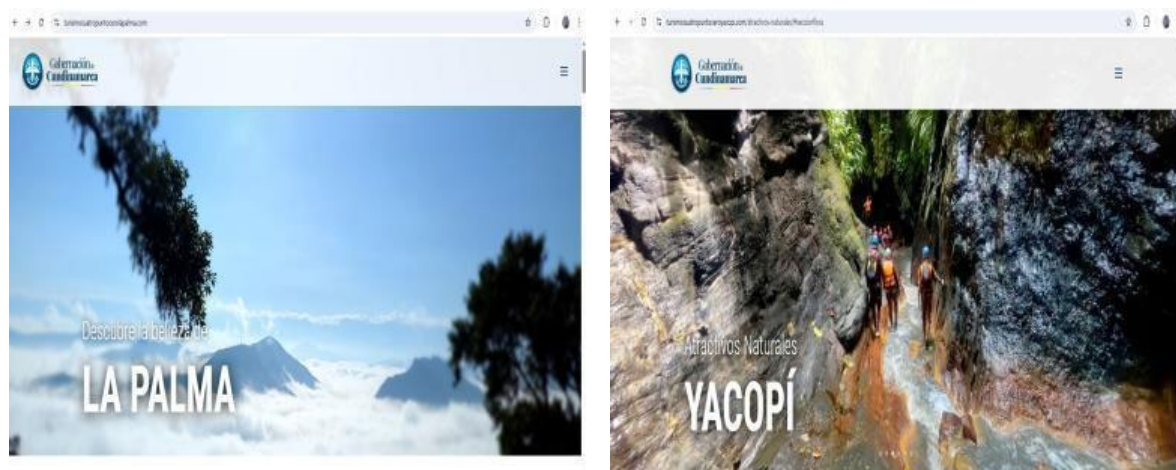


Figure 2: Website of the municipalities of La Palma and Yacopí (Sources: Website of the municipality of La Palma: <https://turismocuatropuntocerolapalma.com/> and Website of the municipality of Yacopí: <https://turismocuatropuntoceroyacopi.com/>).

The use of technologies such as augmented and virtual reality has become established as a strategic tool for highlighting tourist attractions, as well as the physical, cultural, and economic elements that add value to municipalities. These technologies allow for an immersive representation of the rich heritage of these territories, projecting them as destinations where sustainable tourism emerges as a key driver for boosting the local economy.

Therefore, the prototype created integrates the Sustainable Tourism Promotion Model, as well as the development and articulation of a website and an app that provides information about the territory.

Furthermore, the use of the Prototype Sustainable Tourism Promotion Model generates positive social and environmental impacts by promoting the region with a focus on conserving natural and cultural resources. These tools not only promote responsible practices aimed at caring for the environment⁷ but

⁷Williya Achmad and Yulianah Yulianah, "Corporate Social Responsibility of the Hospitality Industry in Realizing Sustainable Tourism Development," *Enrichment: Journal of Management* 12, no. 2 (2022): 1610–16, <https://doi.org/10.35335/enrichment.v12i2.447>.

also strengthen territorial identity and favour the preservation of local heritage, positioning tourism as a comprehensive strategy for sustainable development⁸.



Figure 3: Augmented and virtual reality objects in the municipalities of La Palma and Yacopí.

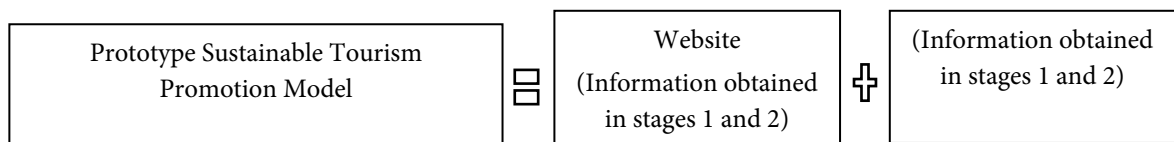


Figure 4: Diagram of the Prototype Model for Sustainable Tourism Promotion.

⁸Elisa Panzera, *Cultural Heritage and Territorial Identity* (Springer International Publishing, 2022), pp. 21

Conclusion

The creation of a Sustainable Tourism Promotion Model allows for the participation of communities, tour operators, national and local authorities, and strengthens the planning and governance of actions established for the promotion of tourism in the regions.

When territories have been affected by violence, strategies can be developed that combine innovative elements and technological development, facilitating community integration, the identification of tourist attractions, and the promotion of cultural and heritage wealth.

The creation of a prototype that articulates social, environmental, economic, and technological development in the regions facilitates a smart, scalable, and sustainable digital promotion strategy. It also allows operators to design plans tailored to customer needs and improve the customer experience.

It is worth noting that this initiative is a pilot project with the potential to be replicated in other contexts worldwide. It can also be enriched by incorporating new elements and information through georeferencing and artificial intelligence, as determined by the researchers involved in this initiative. This would constitute a second phase of the project and would represent a significant contribution to the territories' economies.

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