

Promotion of sustainable tourism in desert environments: The importance of governance, local actors, and tourism products and services

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Abstract: Desert environments face the challenge of promoting sustainable tourism while balancing economic growth with cultural and environmental preservation. In the context of rapid global tourism expansion, effective destination management becomes crucial for positive economic impact and long-term preservation. This study aims to identify key factors influencing the sustainability of tourism. It explores the interactions between local stakeholders, the supply of tourism products and services, and tourism governance. Utilizing structural equation modeling through the PLS-SEM method, data was collected from 150 stakeholders in desert environments. The findings reveal that the involvement of local tourism stakeholders and the supply of tourism products and services significantly impact sustainable tourism in the desert environment. However, we observe a lack of influence between tourism governance and sustainable desert tourism. The novelty of the study lies in the identification of promotional factors for sustainable desert tourism. The originality of this study lies in its in-depth exploration of the mechanisms for promoting sustainable tourism.

Keywords: sustainable desert tourism; tourism governance; local stakeholders' involvement; tourism products and services

1. Introduction

Over the past decades, the tourism industry has emerged as one of the leading service industries in the global economy (Ekanayake and Aubrey, 2012). Considered a major phenomenon of the modern era post-World War II, virtually with people from all social classes from developed countries traveling annually to explore new sites (Cohen, 1984; Urry, 1990). This has been particularly emphasized by the increase in worker incomes and leisure time (Leouifoudi, 2021).

The emergence of a hedonistic society has led to a demand for leisure, giving rise to a thriving industry aimed at organizing people's mobility for entertainment (Urry and Larsen, 2011). Hedonism has encouraged people from all over the world, not just from developed countries, to engage in tourism activities. This has led to the growth of global tourism and increased competition among destinations. In this context, tourists are increasingly seeking unique and intangible experiences, seeking "off-the-beaten-path" adventures (Cocola Gant, 2018). Therefore, tourism has gradually played a significant role in the global gross domestic product and employment in many countries, becoming the main economic branch of some of them (Petrovic and Jelica, 2013).

Tourism serves as a catalyst for growth, fostering job creation, preserving heritage, promoting environmental stewardship, and fostering social cohesion within local communities. However, it also presents significant challenges, namely its substantial impact on resource consumption and contribution to global change (Njoya and Seetaram, 2018). Therefore, it is imperative to steer tourism development in a way that maximizes benefits for the host community, thus underscoring the crucial importance of tourism sustainability (Ross and Wall, 1999).

The sustainability of tourism is intricately linked to effective management of the tourism sector, emphasizing the importance of understanding the dynamic relationship between local tourism stakeholders and governance structures (Zhu et al., 2014). These interactions is fundamental to ensuring economic development while preserving the cultural and environmental integrity of tourism regions, especially the most fragile ones.

Research on tourism dynamics in desert environments, is important due to several key reasons. Desert destinations often face unique challenges such as environmental vulnerability, limited infrastructure, and socio-economic disparities. Desert destinations are often rich in cultural and natural heritage, making them important assets for local communities and global heritage. Therefore, understanding the dynamics of tourism in this context is crucial for developing sustainable management strategies that balance economic development with environmental and social conservation.

Our paper contributes to the understanding of tourism dynamics in fragile destinations, namely desert environments, by examining the interaction between local stakeholders, tourism governance, and tourist supply and demand. We aim to provide valuable knowledge that can inform policymakers, practitioners, and local communities in effectively managing tourism in desert environments, ensuring its long-term viability while safeguarding environmental and socio-cultural integrity.

We begin by elaborating the research model and the theoretical background, and proceed to formulate the research hypotheses. We then present the process of data collection and the data analysis method. The results are presented, followed by discussion and conclusion.

2. Theoretical background and research hypotheses

2.1. The essential role of local stakeholders

Local tourism stakeholders play a central role in governance, exerting decisive influence on the decision-making process and the promotion of sustainable tourism development (Butler, 2017; Giampiccoli and Saayman, 2017; Zhu et al., 2014). Their active involvement is crucial at two interdependent levels.

On one hand, the influence of local stakeholders on governance is notable. They play a significant role in decisions related to tourism governance, actively contributing to shaping the trajectory of regional tourism development (Beritell et al., 2007). Their personal relationships, beliefs, developmental history, and perceptions of tourism impacts directly affect governance (Beritell et al., 2007; Lee, 2013).

On the other hand, local tourism stakeholders themselves are deeply influenced by governance decisions, particularly regarding environmental-ecological and socio-

economic aspects (Le Galès, 1995; Zhu et al., 2014). Strengthening individual and social skills, as well as improving the knowledge and attitudes of local stakeholders, is essential for their influential participation in sustainable tourism development and their transition to a “subjective” position in the local economy (Boley et al., 2018; Leslie, 2012; Park and Kim, 2015; Strydom et al., 2019; Strzelecka et al., 2017).

Furthermore, the involvement of public authorities has been established as an essential element in ensuring the sustainable development of the tourism sector, guiding private sector participation. As the primary driver of infrastructure development, the government exerts a stimulating influence on the private sector, encouraging it to offer a wide range of services based on the newly established infrastructure (Simpson, 2008).

The government’s role extends beyond infrastructure creation to crucial areas such as the development of regional tourism infrastructure, improvement of national legislation in the tourism domain, restoration of cultural, historical, and ecological sites, and creation of favorable conditions for tourist reception (Kerimbergenovich et al. 2020). This governmental involvement is fundamental to ensuring a favorable and sustainable environment, promoting tourism while preserving the cultural, historical, and ecological richness of the regions involved. Therefore, the following hypotheses were formulated.

Hypothesis H1.1: The active Involvement of local actors in desert environments has a positive effect on tourism governance.

Hypothesis H1.2: The active Involvement of local actors in desert environments has a positive effect on tourism products and services.

Hypothesis H1.3: The active Involvement of local actors in desert environments has a positive effect on sustainable tourism.

2.2. The importance of tourism governance

Successful tourism development relies on the participation of stakeholders, yet it is often observed that local communities are excluded or inadequately involved in the initial planning and management phases (Durbin and Ralambo, 1994; Heinen, 1993; Hough, 1998; West and Brechin, 1991). It is precisely at this stage that the importance of multi-level adaptive governance becomes apparent. Multi-level adaptive governance, which integrates multiple stakeholders at different levels, especially at the local level, promotes active participation in decision-making, access to knowledge, and accountability of decision-makers to their constituents (Eakin, 2011). It also highlights that multi-level governance can facilitate the development of these resources, thereby contributing to more effective and informed management of the tourism sector (Bednar et al., 2018; Corfee-Morlot et al., 2009; Gough and Shackley, 2001; Ivey et al., 2004; Lebel et al., 2006; Newig et al., 2017; Pellizzoni, 2003; Rhodes, 2000; Sabatier et al., 2005). Multi-level adaptive governance, with its horizontal and vertical dimensions, reveals the complexity of interactions among different levels of government, as illustrated by Hooghe and Marks (2003). Decision-making is not confined to the central government but integrates various actors at different levels, thus creating a complex network of relationships. According to Eakin (2011), key

concepts to consider include participation in decision-making, access to knowledge and other resources, as well as accountability of decision-makers to their constituents.

In the other hand, Horizontal governance, as illustrated by Corfee-Morlot et al. (2009) and Granberg et al. (2019), enables effective coordination among various governmental and non-governmental actors, both private and public, at the local and regional levels. This approach promotes a shared understanding of issues, as mentioned by Lebel et al. (2006), and encourages the sharing of knowledge and information, in line with Bednar et al. (2018) and Sabatier et al. (2005). It transforms decision-making processes by allowing lower-level initiatives to contribute to decisions at higher levels, as supported by Rhodes (2000) and Ivey et al. (2004), and fosters social learning and innovation through the participation of non-governmental actors, as described by Pellizzoni (2003) and Newig et al. (2017), thereby contributing to more sustainable decisions. Moreover, this approach addresses adaptation issues by enhancing local resilience, as suggested by Corfee-Morlot et al. (2009), and non-governmental actors play a key role in monitoring and evaluating the effectiveness of policies against stated objectives, as mentioned by Gough and Shackley (2001).

Therefore, the following hypothesis was formulated. Therefore, the following hypotheses were formulated.

Hypothesis H2.1: Tourism Governance positively affects tourism products and services.

Hypothesis H2.2: Tourism Governance positively affects Sustainable Tourism.

Hypothesis H2.1: Active Involvement of Local actors in desert environments has a positive effect on Sustainable Tourism.

Hypothesis H2.2: Tourism Governance positively effects Sustainable Tourism.

2.3. The importance of tourism products and services

In an era where sustainability is becoming increasingly important (Rhouiri et al., 2024), the tourism industry is evolving to incorporate environmentally responsible practices alongside its diverse range of products and services. Tourism is characterized by a wide diversity of products and services, encompassing both tangible and intangible elements offered to satisfy the needs or desires of clients (Albayrak et al., 2010; Tocquer and Zins, 1999; Yasarata et al., 2010). Indeed, the tourist product is a broad concept, including activities, services, and benefits contributing to a complete tourist experience (Smith, 1994). It is defined as a combination of tangible and intangible elements, providing desired benefits to one or more specific clients (Tocquer and Zins, 1999). The evolution of tourist flows over the past decades has been marked by the diversification of tourist products (Yunis, 2006). Thus, the tourist product manifests as an integrated entity, combining concrete and abstract components to offer a rich experience tailored to the diverse expectations of travelers. Considering the tourist product as the result of a human operation, intended to be introduced into the market to attract attention, be acquired, used, or consumed to meet specific needs and desires (Kotler et al., 1999), Jefferson and Lickorish (1988) share a similar perspective. They define the tourist product as a set of physical features and services linked to symbolic associations, aiming to satisfy buyers' desires and needs, designed to meet consumers' potential needs (Xu, 2010) and thereby attract tourists to

destinations (Benur and Bramwell, 2015). According to Smith (1994), tourist products encompass five elements: hospitality, service, inclusion, choice, and physical facilities, all of which are attraction factors motivating tourists (Benur and Bramwell, 2015). The process of developing a tourist product is distinguished by raw inputs, initiating generic production, followed by intermediate products and inputs converging towards the tourist experience as the final product (Smith, 1994).

Additionally, Lewis and Chambers (1989) present another view of the tourist product, seeing it composed of goods, environment, and services. Another concise proposition by Jefferson and Lickorish (1988) defines it as a satisfying activity in a desired destination. This conception highlights the necessity of collaboration among various tourism stakeholders, with local public authorities playing a particularly significant role as mediators in the relationship between local community and tourists satisfaction (Frînculeasa and Chişescu, 2018; Hadach and Tebbaa, 2015). This cooperation among destination stakeholders, crucial for ensuring sustainability and maintaining sustainable tourism activity, also requires close collaboration with governments and local authorities, constituting a prerequisite for the design and implementation of sustainable tourism offerings (Hadach and Tebbaa, 2015). Although stakeholder collaboration is recognized as an essential tool for promoting destination image in sustainable tourism management (Michopoulou et al., 2015), it remains complex and relatively rare (Waligo et al., 2013). The tourist product is characterized by the diversity of its components, both tangible and intangible, which vary according to spatial and temporal interference and succession (Vellas, 1992). The immaterial and symbolic aspect, emphasized by Cuvelier (1998), is of paramount importance, allowing individuals to imprint their desires and personality. Tourist services, on the other hand, adopt a more abstract dimension, focusing on the analysis of supply elements to make a tourist destination attractive (Hazebroucq, 2006; Lozato-Giotart et al., 2012).

From this perspective, tangible elements give the product a material reality, while tourist services belong to the intellectual domain (Hazebroucq, 2006; Lozato-Giotart et al., 2012). Defined holistically, the tourist product encompasses everything that can be marketed to satisfy tourists' needs or desires and can be fixed, such as a hotel, or mobile, such as a cruise ship (Smith, 1994). As a complex construction, the tourist product combines various spatial dimensions (economic, cultural, and geographical, ...) and productive mechanisms (hotels, transportation, and catering), with variable scope (excursions, vacations, short stays, and leisure) and complex relational patterns, collective or personal, standardized or spontaneous, commercial or non-commercial (Hazebroucq, 2006). This concept transcends the mere materiality of goods to also encompass memorable activities and experiences of tourists, who seek an exceptional experience and record impressive memories (Deng et al., 2002; Wang and Hsu, 2010). The tourist product, seen as an integrated entity, goes beyond the simple exploitation of local products to encompass the discovery of culture, traditions, the place of production and accommodation, thus offering meaningful cultural experiences (Hall and Sharples, 2003; Hjalager, 2002). This view of the tourist product is based on the diversity of tangible and intangible aspects, contributing to its appeal and complexity. Analyzing supply elements is essential for an attractive tourist destination (El Hafid et al., 2018; Yasarata et al., 2010). Indeed, Stafford identified three constitutive elements

of the core of the tourist product, the first being the tourist attraction, the second the infrastructure (accommodation, transportation, catering, etc.), and the last the entertainment (Stafford, 1995). In this way, the tourist product emerges as a harmonious whole, connecting tangible elements and intangible experiences to create a complete and attractive destination for travelers. Therefore, the following hypothesis was formulated. Hypothesis H3: Tourism Products and Services positively influence sustainable Tourism.

Based on our literature review, we build a model exploring the importance of tourism governance, local actors and tourism products and services in the promotion of sustainable tourism in desert destinations (see **Figure 1**).

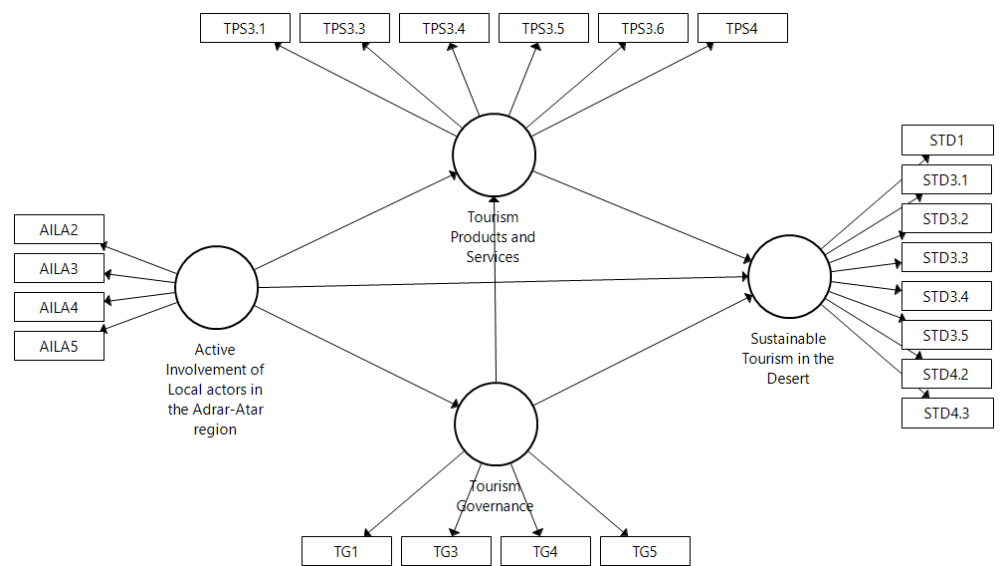


Figure 1. Research model.

3. Research methodology

The research will primarily adopt a confirmatory perspective, aiming to identify the key factors influencing the promotion of tourism sustainability within our sample, the Adrar-Atar region of Mauritania. To achieve this objective, the conceptual framework was constructed through an in-depth literature review, specifically within the context of confirmatory factor analysis (CFA) studies that facilitate the modeling of measurement and structural aspects (Bensouda and Benali, 2023a; Sarstedt et al., 2020). The study questionnaire was administered to a population composed of tourism stakeholders, including tourist accommodation and catering establishments, cultural heritage agencies, as well as tourism trade actors (see **Table 1**) in the Adrar-Atar region of Mauritania. A total of 150 responses were collected using a quantitative questionnaire. Data collection took place from September 2022 to January 2023.

Table 1 highlights the diversity of our sample. It provides an overview of the socio-professional distribution of local actors involved in our study, with a total of 150 respondents. The analysis reveals distinct categories, including 6.00% ($n = 9$) engaged in tourist accommodation and catering, 22.67% ($n = 34$) in tourist guiding and logistics, 2.00% ($n = 3$) affiliated with the Cultural Heritage Agency, 55.33% ($n = 83$) identified as tourism stakeholders, and 14.00% ($n = 21$) classified as commercial actors. This

distribution underscores the diversity of local stakeholder involvement in various aspects of tourism activities within our sample, highlighting the variety and importance of different roles and contributions within the studied population.

Table 1. Socio-professional category of local actors ($N = 150$).

	Frequency	Percentage
Tourist accommodation & catering	9	6.00%
Tour guide & logistics	34	22.67%
Cultural Heritage Agency	3	2.00%
Tourism actors	83	55.33%
Trade actors	21	14.00%

Source: Authors.

Our questionnaire includes questions related to the following variables: Active involvement of local stakeholders, Sustainable tourism in the desert environments, Tourism governance, and Tourist products and services. Using a five-level Likert scale ranging from “1: Strongly Disagree” to “5: Strongly Agree,” respondents were able to express their opinions on these dimensions. For the analysis of research hypotheses, we used the PLS-SEM method, recognized for its relevance in modeling direct and indirect paths in causal research (Bensouda and Benali, 2022). The statistical tool used was the SmartPLS-3 software, assisting in generating results of confirmatory factor analysis. This approach aimed to facilitate solutions while examining the hypothesized causal relationships between different constructs in a complex structural model (Gudergan et al., 2008; Hair et al., 2014).

4. Results

4.1. Measurement model

4.1.1. Convergent validity

We started by byassessing the convergent validity of the measurement model. First, we assessed factor loadings, meaning to the extent to which each variable is related to its items. From **Table 1**, all factor loadings are greater than 0.4, which indicates that all items are fairly correlated to their respective construct.

We then assessed the convergent reliability of our model using two key criteria: composite reliability and average variance extracted (AVE). Composite reliability, which measures the internal consistency of measurement scales, has values between 0 and 1 according to Chin (1998), and a threshold deemed acceptable is generally above 0.7 (Bensouda and Benali, 2023b; Tenenhaus et al., 2005).

The average variance extracted (AVE) enables us to understand how a latent theoretical construct explains the variance shared between the latent construct and the items that measure it (Hair et al., 2010). The recommendations of Fornell and Larcker (1981) and Chin (1998) indicate that a measure is considered reliable when the AVE is greater than 0.50, meaning that 50% or more of the variance of the measure is captured by the indicators of the construct.

Indeed, the convergent validity of our model is confirmed, as composite reliability exceeds 0.7 and AVE exceeds 0.5. Further details on reliability and construct validity are available in **Table 2**.

Table 2. Results of measurement model—convergent validity.

Variables	Items	Factor Loadings	Fiabilité composite	Average Variance Extracted (AVE)
Active Involvement of Local actors in desert environments	AILA2	0.711	0.844	0.576
	AILA3	0.792		
	AILA4	0.784		
	AILA5	0.747		
Sustainable Tourism in the Desert	STD1	0.638	0.889	0.509
	STD3.1	0.759		
	STD3.2	0.783		
	STD3.3	0.798		
	STD3.4	0.813		
	STD3.5	0.815		
	STD4.2	0.548		
Tourism Governance	TG1	0.655	0.841	0.572
	TG3	0.805		
	TG4	0.764		
	TG5	0.791		
Tourism Products and Services	TPS3.1	0.735	0.865	0.519
	TPS3.3	0.685		
	TPS3.4	0.630		
	TPS3.5	0.760		
	TPS3.6	0.806		
	TPS4	0.693		

Source: SmartPLS 3 release.

4.1.2. Discriminant validity

After assessing the convergent validity of our model, we move to evaluating its discriminant validity. Discriminant validity in the PLS approach measures the extent to which the components of one construct differ from the components of another construct in the model. This test is based on the fundamental idea that a construct shares more variance with its associated indicators than with the indicators of any other construct. To assess discriminant validity, we used three criteria: the Fornell-Larcker criterion (Bensouda et al., 2023; Fornell and Larcker, 1981), Cross Loading and HTMT.

The Fornell-Larcker criterion (Fornell and Larcker, 1981) is the first criterion, and involves comparing the square root of the AVE with the correlations between the constructs in the model. In practice, the square root of the AVE must exceed the highest correlation between one construct and another. This translates into

a check that diagonal elements have higher values than off-diagonal elements. The results of the Fornell-Larcker criterion confirm its satisfaction (see **Table 3**).

Table 3. Fornell-Larcker criterion.

	Active Involvement of Local actors in desert environments	Sustainable Tourism in the Desert	Tourism Governance	Tourism Products and Services
Active Involvement of Local actors in desert environments	0.759			
Sustainable Tourism in the Desert	0.438	0.713		
Tourism Governance	0.463	0.471	0.756	
Tourism Products and Services	0.422	0.743	0.503	0.720

Source: Smart PLS 3 release.

The second criterion concerns the assessment of cross-saturation (see **Table 4**). The data in the table indicate that all the factor loadings associated with each item are higher than their respective cross-loadings, confirming the discriminant validity check (Henseler et al., 2015).

Table 4. Cross-Loading.

	Active Involvement of Local actors in desert environments	Sustainable Tourism in the Desert	Tourism Governance	Tourism Products and Services
AILA2	0.711	0.311	0.291	0.235
AILA3	0.792	0.252	0.324	0.358
AILA4	0.784	0.280	0.321	0.277
AILA5	0.747	0.443	0.432	0.377
STD1	0.462	0.638	0.499	0.520
STD3.1	0.278	0.759	0.391	0.548
STD3.2	0.235	0.783	0.361	0.513
STD3.3	0.346	0.798	0.301	0.640
STD3.4	0.301	0.813	0.353	0.530
STD3.5	0.300	0.815	0.344	0.614
STD4.2	0.275	0.548	0.212	0.433
STD4.3	0.289	0.458	0.164	0.371
TG1	0.353	0.309	0.655	0.318
TG3	0.319	0.389	0.805	0.459
TG4	0.226	0.311	0.764	0.372
TG5	0.473	0.399	0.791	0.365
TPS3.1	0.330	0.523	0.293	0.735
TPS3.3	0.227	0.583	0.343	0.685
TPS3.4	0.297	0.439	0.240	0.630
TPS3.5	0.288	0.543	0.395	0.760
TPS3.6	0.357	0.580	0.386	0.806
TPS4	0.322	0.527	0.483	0.693

Source: SmartPLS 3 release.

Finally, we also tested discriminant validity using the heterotrait-monotrait correlation ratio (HTMT) (see **Table 5**). The data in the table reveal that all values are below the recommended threshold of 0.85, as advocated by Henseler et al. (2015) and Kline (2005).

Table 5. Heterotrait-Monotrait Ratio (HTMT).

	Active Involvement of Local actors in desert environments	Sustainable Tourism in the Desert	Tourism Governance	Tourism Products and Services
Active Involvement of Local actors in desert environments				
Sustainable Tourism in the Desert	0.531			
Tourism Governance	0.583	0.577		
Tourism Products and Services	0.524	0.887	0.633	

Source: Smart PLS 3 release.

After conducting the three tests, our model’s discriminant validity is confirmed.

4.2. Structural model

We then proceeded to evaluate the structural model, having ensured the reliability and validity of the measurement scales during the evaluation of the measurement model. This structural model represents the hypothetical paths between the latent variables, i.e. the constructs, of the model. Evaluation of the structural model involves several steps, beginning with analysis of the “coefficient of determination R^2 ”, followed by “indirect effect F^2 ”, “predictive relevance Q^2 ”, “goodness of fit (GoF)” and finally “path significance”.

4.2.1. The coefficient of determination and the predictive relevance

Model quality is determined by the robustness of each structural path, assessed by the coefficient of determination R^2 , representing the proportion of variation in dependent (endogenous) variables explained by one or more independent (exogenous) variables (Elliott and Woodward, 2007; Hair et al., 2011; Hair et al., 2012). In addition, the R^2 value must be equal to or greater than 0.1 (Falk and Miller, 1992).

In **Table 6**, we observe that the R^2 value for the models relating to Tourism Products and Services, Tourism Governance, and Sustainable Desert Tourism exceeds 0.10, in line with the recommendations of Falk and Miller (1992) and Hair et al. (2012).

Concerning the Q -squared, it assesses the predictive relevance of endogenous variables, which must be greater than zero to be considered adequate. **Table 7** highlights that the Q^2 for all endogenous variables is greater than zero (Fornel and Cha, 1994; Janadari et al., 2016), thus establishing the predictive relevance of the model.

Table 6. The coefficient of determination R^2 & the predictive relevance Q^2 .

	R^2	Q^2
Sustainable Tourism in the Desert	0.576	0.275
Tourism Governance	0.214	0.111
Tourism Products and Services	0.298	0.144

Source: SmartPLS 3 release.

4.2.2. Goodness of Fit

In addition, we assessed the overall fit of the model using the Goodness of Fit (GOF) criterion. As defined by Tenenhaus et al. (2005), GOF measures overall model fit. The aim of GOF is to simultaneously evaluate the measurement model and the structural model, with particular emphasis on overall performance (Henseler and Chin, 2010; Henseler and Sarstedt, 2013).

Equation (1) for calculating the GoF is as follows (Source: Authors):

$$GOF = \sqrt{R^2 * AVE}$$

Table 7. The model fit using GoF.

	R^2	AVE	GoF
Active Involvement of Local actors in desert environments		0.576	
Sustainable Tourism in the Desert	0.576	0.509	
Tourism Governance	0.214	0.572	
Tourism Products and Services	0.298	0.519	
The sum	1.09	2.18	
The mean	0.36	0.54	
			0.44

Source: Authors.

The table reveals a value of 0.44 for the Goodness of Fit (GoF) criterion, which according to Wetzels et al. (2009) qualifies as “large” given that it exceeds 0.36. We can thus conclude that the GoF model in this study is more than sufficient to validate the relevance of the PLS model.

4.2.3. The path coefficient

To improve the assessment of goodness of fit, we measured the influence between latent variables using path coefficients, also known as standardized partial regression coefficients (Dewey and Lu, 1959). At the same time, we tested the significance of the hypothesized relationships between the latent variables in our structural model using Student’s *t*-test. The probability associated with the Student test was used to determine any significance.

For hypothesis H1.1, the results revealed a positive effect of active involvement of local stakeholders in desert environments on sustainable tourism in the desert ($\beta = 0.125, t = 2.088, p\text{-value} = 0.037$). Hypothesis H1.1 is therefore confirmed.

Hypothesis H1.2, according to which the active involvement of local stakeholders in desert environments has a positive and significant influence on the tourism governance variable ($\beta = 0.463, t = 7.026, p\text{-value} = 0.000$) is verified. This means

that when the active involvement of local stakeholders in desert environments increases, the tourism governance variable also increases.

With regard to hypothesis H1.3, the results reveal that the active involvement of local stakeholders in desert environments has a significant positive influence on tourism products and services ($\beta = 0.240, t = 3.077, p\text{-value} = 0.002$). Hypothesis H1.3 is therefore confirmed. The results reveal that tourism governance has a positive and significant influence on tourism products and services ($\beta = 0.392, t = 4.405, p\text{-value} = 0.000$) and it does not have a positive and significant influence on sustainable desert tourism ($\beta = 0.088, t = 1.081, p\text{-value} = 0.280$). Hypothesis H2.1 is accepted, but hypothesis H2.2 is rejected.

The results of hypothesis H3 revealed the presence of a positive influence of tourism products and services on sustainable desert tourism ($\beta = 0.646, t = 9.911, p\text{-value} = 0.000$). Hypothesis H3 is therefore supported.

The results of the path coefficients are presented in **Table 8** and **Figure 2**.

Table 8. Test the hypothetical relationships of the research.

Hypotheses		Original Sample	T Statistics	P Values	Decision
H1.1	Active Involvement of Local actors in desert environments → Tourism Governance	0.463	7.026	0.000	Supported
H1.2	Active Involvement of Local actors in t desert environments → Tourism Products and Services	0.240	3.077	0.002	Supported
H1.3	Active Involvement of Local actors in desert environments → Sustainable Tourism	0.125	2.088	0.037	Supported
H2.1	Tourism Governance → Tourism Products and Services	0.392	4.405	0.000	Supported
H2.2	Tourism Governance → Sustainable Tourism	0.088	1.081	0.280	Not supported
H3	Tourism Products and Services → Sustainable Tourism	0.646	9.911	0.000	Supported

Source: Based on SmartPLS 3 results.

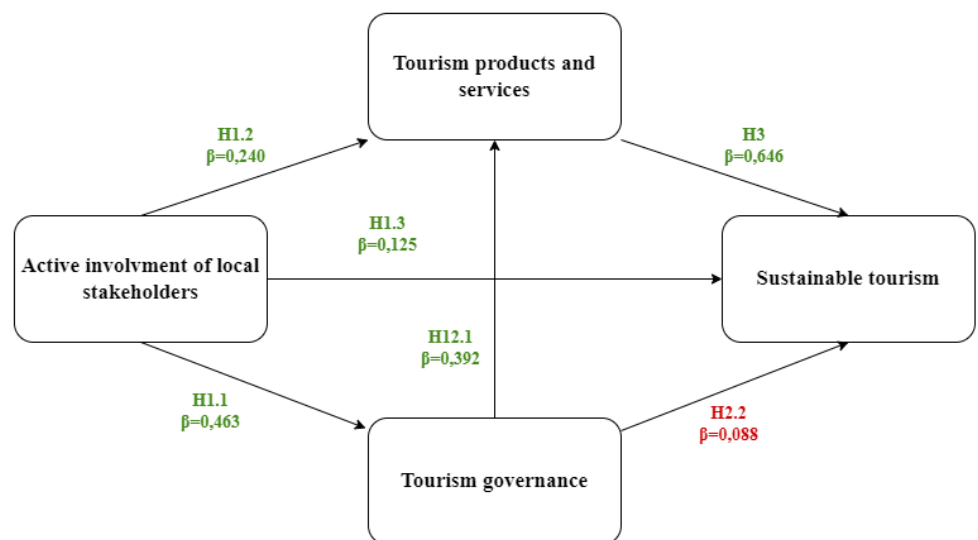


Figure 2. Results of the PLS analysis.

Source: Authors.

5. Discussion

In this research, we examined the interactions between local tourism stakeholders, tourism governance and the supply of tourism products and services in the promotion of sustainable desert tourism in desert environments. We used the variable Active involvement of local stakeholders in desert environments as an independent variable, the cornerstone of sustainable desert tourism promotion. The following results were obtained:

(1) The active involvement of local stakeholders in desert environments has a positive effect on tourism governance. The previous literature assumes that the active involvement of local tourism stakeholders is crucial for a successful tourism governance (Beritell et al., 2007; Eakin, 2011; Le Galès, 1995; Le Galès, 2003; Marks and Hooghe, 2003; Plog, 1974; Zhu et al., 2014). Local tourism stakeholders are themselves profoundly influenced by governance decisions, particularly with regard to environmental, ecological and socio-economic issues.

(2) The active involvement of local stakeholders in desert environments has a positive and significant influence on tourism products and services. Our results are consistent with the previous literature, stating that local tourism stakeholders can play a key role in promoting the economic prosperity and sustainability of the tourism region (De Bruyn and Meyer, 2022). Their initiatives to develop innovative, quality tourism products and services enhance the attractiveness of the region and contribute to the economic well-being of local communities.

(3) The active involvement of local stakeholders in desert environments has a significant and positive influence on sustainable tourism in the desert. The previous literature assumes that the involvement of local stakeholders occupy a central position in tourism governance and play a crucial role in decision-making and the promotion of sustainable tourism development through (Giampiccoli and Saayman, 2017; Giampiccoli and Saayman, 2017; Li et al., 2020; Zhu et al., 2014).

(4) Tourism governance has a positive effect on tourism products and services. . This result is inconsistent with previous literature, demonstrating that tourism governance directly influence local stakeholders, who in turn implement initiatives to satisfy the changing needs of travelers while preserving natural and cultural resources, thus impacting the quality of tourism products and services (Butler, 2017), in line with horizontal governance theory (Corfee-Morlot et al., 2009; Granberg et al., 2019; Hanssen et al., 2013).

(5) Tourism governance does not have a direct positive effect on sustainability of tourism. This result is inconsistent with previous literature which considers that tourism governance has direct positive effect on the sustainability of desert tourism. This discrepancy suggests that other region-specific factors may moderate the influence of tourism governance, highlighting the complexity of the relationships between governance, local actors and sustainability (Butler 2017; Corfee-Morlot et al., 2009; Granberg et al., 2019; Hanssen et al., 2013).

(6) Tourism products and services have a positive effect on sustainable tourism. Our results are consistent with the previous literature. Our results show the presence of a positive influence of tourism products and services on sustainable desert tourism. This result could be explained by the fact that local tourism stakeholders play a

fundamental role in promoting sustainable tourism development (Butler, 2017; Giampiccoli and Saayman, 2017; Zhu et al., 2014), particularly, those who innovate, develop and maintain the sustainability of tourism products and services, play a key role in promoting sustainable desert tourism (Achmad et al., 2023; Castro-Spila et al., 2018).

The results of this study are particularly important for community members, policy makers and business owners in desert destinations. For local communities, understanding the dynamics of tourism sustainability is essential to preserving their cultural heritage, improving their livelihoods and ensuring long-term environmental management. Policymakers can draw on the results of this research to formulate targeted strategies to promote sustainable tourism practices, address the challenges specific to desert environments and foster inclusive growth. Furthermore, business leaders stand to gain from identifying the key factors to promote sustainable tourism, enabling them to adapt their services and products to better meet tourists needs while supporting the local economy and guarantying environmental sustainability.

6. Conclusion

The study examines the interactions between local tourism stakeholders, the supply of tourism products and services, and tourism governance in desert environments, with a view to promoting tourism sustainability. The results indicate that the involvement of local tourism stakeholders and the supply of tourism products and services play a crucial role in promoting sustainable tourism. However, tourism governance did not show any significant influence on tourism sustainability in this region. This study contributes to a better understanding of the dynamics of sustainable tourism in desert environments.

The research answered the research question by identifying the determining factors for promoting the sustainability of tourism in desert environments. The involvement of local tourism stakeholders and the supply of tourism products and services were identified as important factors in promoting sustainable tourism in this region.

The results of this study are important because they highlight the key factors that can contribute to the promotion of sustainable tourism in a desert environment. By highlighting the factors favoring the development of sustainable tourism in desert environments, the results of this study offer crucial information to local actors, decision-makers and stakeholders, facilitating the implementation of specific policies and initiatives to promote tourism sustainability.

The results of this study have significant practical implications for local tourism stakeholders and those responsible for tourism governance. It is imperative to strengthen collaboration between local stakeholders, as described by Jamal and Getz (1995) as community-based tourism planning of an inter-organizational tourism domain aimed at solving planning problems and managing issues related to domain development. The underlying aim of such collaboration, according to Tosun (2000), is to balance power between all stakeholder groups, and a crucial step in establishing community partnerships and fostering collaboration in tourism, as emphasized by Hardy and Beeton, (2001), is to identify and actively involve stakeholders. From this

perspective, promoting sustainability training and awareness (Khan et al., 2022), as well as improving the supply of tourism products and services, are essential to support the sustainability of tourism in desert environments.

This study has a number of limitations that merit consideration.

First, this research included local tourism stakeholders in one desert environment. Therefore, future research should examine the local tourism stakeholders in other desert tourist destinations and other tourist destinations, including maritime and mountain tourist destinations. Second, this research on desert tourism and environments is cross-sectional, capturing data at a single point in time. Longitudinal studies are needed to assess changes and trends over time in these fragile destinations.

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