

Article

Identifying Coastal Cities from the Perspective of “Identity-Structure-Meaning”: A Study of Urban Tourism Imagery in Sanya, China

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Abstract: Urban tourism imagery is an essential factor affecting the competitiveness of cities. However, most existing studies use small data methods such as interviews and questionnaires to explore tourists’ perceptions of cities without combining big data for analysis. In addition, there is relatively little research on the tourism imagery of coastal cities. Therefore, this study analyzes the data from 523 travelogues from a three-dimensional perspective of identity, structure, and meaning, using methods such as BERTopic, aiming to explore the tourism imagery of coastal cities perceived by tourists. The results show the following: (1) In terms of identity, Sanya’s urban tourism imagery has the attribute of “external explicit-internal implicit”, which satisfies tourists’ visual and spiritual experiences. (2) Regarding structure, Sanya has a clear regional division of imagery and a core–edge diffusion distribution among regions. (3) Regarding meaning, tourists’ attitudes toward Sanya are polarized. Positive emotions predominate in the overall perception of meaning, but 25% of the negative emotions require urgent attention. This study provides a reference for the sustainable development of tourism cities and the marketing management of destinations.

Keywords: urban tourism imagery; coastal tourism; data mining; tourist perception; destination management



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1. Introduction

Against the background of coastal tourism into the Blue Ocean era, coastal city economies are developing rapidly. According to the China Marine Economic Statistics Bulletin, the coastal tourism market is gradually recovering, achieving added value of CNY 1529.7 billion in 2021, up 12.8% from 2020 [1]. Therefore, scientific planning and rational development of the coastal tourism industry have important practical significance for promoting the economic development of coastal cities. In 2012, the European Commission (EC) proposed the Blue Growth Strategy, which aims to enhance the value of the marine economy by promoting the rapid development of coastal and maritime tourism and other sectors [2]. China has also long attached great importance to the utilization and management of coastal tourism, proposing several marine development strategies, such as “Accelerating the construction of a maritime power” and “Actively expanding the space for marine economy development” [3,4]. The deployment of a series of marine policies is conducive to promoting the transformation of the marine economy from high-speed growth to high-quality development, providing more opportunities and resources for the coastal tourism industry [5]. It is evident that the coastal tourism fever is unabated and faces a broad development opportunity in the future. Most existing coastal city studies focus on coastal tourism competitiveness, tourism demand, and resources [6–8]. However, there is a lack of in-depth exploration of the tourism imagery of coastal cities.

Urban tourism is a form of tourism that relies on modern urban facilities that comprehensively utilize the rich resources within a city, and plays an essential role in supporting local economic and cultural development [9]. Regional and environmental differences

create a different look and feel for each city, so there are significant differences in the landscape and culture of each city [10], and the charm of each city is precisely reflected in this [11]. As cities become more attractive as tourism destinations, tourists have a richer consumer experience in the urban area and gradually increase their selection criteria for cities [12]. The competition between tourist cities is becoming increasingly fierce, shifting from the competition for scenic spots in the past to the competition for the overall tourism imagery of the city [13]. In addition, urban tourism imagery plays a decisive role in urban development and management. In the planning of urban tourism imagery, it is necessary to consider the molding of unique imagery, the inheritance of historical and cultural heritage, the improvement in public facilities, etc., which not only improves the overall quality and image of the city, but also improves the quality of life of residents and tourists [14,15]. At the same time, excellent and unique urban tourism imagery enhances the charm of the city, which will attract more tourists and promote the development of the city's economy [16].

As consumers of tourism products and services, tourists' perceptual evaluation of destinations can more accurately reflect urban tourism imagery, tourist satisfaction, and issues in urgent need of improvement [17]. Early on, scholars used cognitive mapping, face-to-face interviews, and questionnaires to explore tourists' perceptions of urban imagery [18,19]. However, the quantity of data from these research methods is limited and insufficient to reflect the comprehensive information on urban imagery [20]. With the popularization of the internet, tourists are more willing to express their true feelings about their consumption experience on social media platforms [21]. Tourist-generated content (TGC) contains not only tourists' perceived imagery of the destination, but also travel itineraries and sentimental evaluations [22,23]. Previous studies have compared social media analysis with city images derived from traditional methods, verifying that TGC can serve as reliable data for perceived urban imagery in the digital era [24]. Obviously, TGC provides an essential and sufficient data source for studying the perception of urban tourism imagery [25]. Among this information, online travelogue texts have the characteristics of easy access and a large quantity, and can intuitively reflect tourists' perception of tourism imagery [20]. Therefore, this study selected the online travelogues in TGC as research data.

TGC contains rich and sufficient information, but its data advantages have not been fully utilized, and new technologies are needed to accurately grasp the thematic features of the perception of tourist imagery [26]. In addition, current research on the perception of tourism imagery often equates coastal cities with general places, downplaying the uniqueness of cities [27,28]. However, there is no research on analyzing the tourism imagery of coastal areas from a macro perspective at the urban level. As Ashworth commented, "Those who study tourism overlook cities, while those who study cities overlook the tourism industry" [29]. Therefore, this study took the online travelogues of Sanya as an example and used BERTopic for text theme analysis. Then, combining the three-dimensional perspective of "identity-structure-meaning" to identify tourists' perception of the coastal city, this study fills the gap in research on tourism imagery from the urban level. In addition, using a sentiment dictionary to explore precise factors that affect tourist satisfaction can provide more scientific guidance for the projection and development of tourism imagery in coastal cities.

2. Literature Review

2.1. Coastal Tourism

In the present era, tourism has become one of the most significant industries in the world, with a crucial impact on social and economic development [30,31]. As the fastest-growing sector in the tourism industry, coastal tourism has become one of the most popular modes of tourism and a vacation [32]. Coastal tourism plays a pivotal role in the marine economy, fostering the urbanization of coastal regions and enhancing the living standards and quality of life for local residents [33]. At the same time, coastal tourism generates financial revenue for local governments, enabling them to support the development and conservation of marine resources, as well as the management of the

marine ecological environment [34]. China has a long coastline and abundant coastal resources, providing vast space for the growth of the coastal tourism industry [35]. From an industrial structure perspective, China's marine economy system maintains a development pattern referred to as "three-two-one," wherein the proportion of the tertiary industry continues to rise [4]. Coastal tourism directly or indirectly contributes to the growth of the tertiary industry, including hotels, entertainment, commercial services, and transportation, which is conducive to improving the economic structure of coastal cities in China [35]. In the context of economic growth, production and consumption in coastal regions have intensified, presenting significant development opportunities for the tourism industry in coastal cities [2].

Research in the context of tourism has shown that the overall image of destinations is one of the main factors that tourists consider when choosing a destination [28]. Coastal destinations attract many tourists with the unique "sun, sea, and sand" (3S) resources and provide them with a distinctive tourism experience [27]. However, these elements are considered insufficient as tourists increasingly demand unique, authentic, and culturally distinctive products [28]. It is expected that the tourism value of coastal areas will continue to increase in the future, and it is crucial to conduct research on coastal cities to better understand the coastal tourism industry and create positive economic consequences for related industries and regions [36]. Therefore, there is an urgent need to investigate the tourists' perceived urban tourism image, promote the differentiated positioning of coastal cities, and comprehensively enhance tourism competitiveness.

2.2. Urban Tourism Imagery

In the 1960s, Kevin Lynch's book "The Image of the City" initiated the study of urban imagery. Urban imagery is the subjective impression of a city formed in people's minds through the process of observing and perceiving the city [37]. It is the consequence of the two-way interaction between the observer and the urban spatial environment, consisting of three parts: identity, structure, and meaning [38].

Urban imagery and urban tourism imagery are both related and distinct from each other. Essentially, both refer to the imagery perceptions that people form in the process of observing and experiencing their surroundings. However, urban tourism imagery emphasizes paying more attention to the tourism environment in the city [39]. As far as the research subject is concerned, the study of urban imagery mainly focuses on residents' imagery perception of the city they live in. Urban tourism imagery extends to tourists' understanding of the imagery of the tourism city [40]. Although urban tourism imagery and urban imagery are not the same in terms of content, there is significant consistency in their types. Therefore, the relevant theoretical results of urban imagery can be applied to the study of urban tourism imagery. It can be said that urban tourism imagery refers to tourists examining the city from their perspective and forming personal tourism impressions of the city [41].

Compared to residents' familiarity with long-term life in their city, tourists' stay time is brief [42]. Therefore, their perception of the city relies more on the intuitive stimulation of tourism imagery elements [43], and the imagery elements thus have great significance in urban tourism research. Through empirical research, Lynch proposed the concept of five elements of urban imagery: path, node, district, edge, and landmark [37]. Similarly, tourists can also form a visual awareness and initial understanding of a city with the help of their perception of the five elements. Therefore, the structural elements of urban tourism imagery can also be categorized into five types: path, node, district, edge, and landmark.

2.3. Perception of Urban Tourism Imagery Based on TGC

With the rise in the popularity of social media, people are increasingly relying on on-line data when choosing travel destinations, such as official travel tweets and promotional videos [44]. At the same time, tourists are also becoming active consumers, documenting their travel experiences by uploading comments, travelogues, photos, and other formats,

thereby contributing to the dissemination of destination images [45]. The rich TGC shapes tourists' perceptions of the city and is highly influential in their decision-making process [46]. However, existing research has shown that most studies on urban tourism imagery focus on traditional data collection methods such as questionnaire surveys and interviews, and the analytical advantages of TGC have not been fully utilized [20]. It is worth noting that network data analysis methods, as a powerful tool, can not only mine valuable information about urban tourism from large-scale data but also help destination marketers develop personalized tourism services [47]. Therefore, it is necessary for destination marketers to pay attention to tourist perception in TGC and adjust the tourism marketing direction of the destination accordingly [48].

As a direct reflection of tourist needs and emotions, TGC contains a substantial amount of information that can be mined to provide valuable insights for destination managers [22]. Wang et al. used the LDA theme model to model TGC, revealing the differences between tourists' perception of the destination image (TDI) during the trip and their perception after the trip, and establishing a panoramic view of TDI [49]. Peng et al. combined the LDA model with a domain dictionary-based sentiment analysis method to explore tourists' perceptions of the image of the host city of the Winter Olympics [50]. To overcome the drawbacks of probabilistically generated topic modeling, Sánchez-Franco and Rey-Moreno used BERTopic to model the theme of accommodation reviews, believing that the topics proposed by models such as LDA or PLSA are more representative and interpretable [26]. Therefore, our research continues to use the BERTopic model and combines emotional analysis and spatial analysis techniques to conduct a comprehensive and three-dimensional examination of tourists' perceptions of urban tourism imagery.

3. Materials and Methods

3.1. Research Framework

Based on the online travelogue data of Sanya, this study analyzed the semantic association, digital footprint, and semantic affective tendency. Based on the above results, tourists' cognitive, spatial, and sentimental imagery of Sanya was formed to provide perceptual feedback on the "identity-structure-meaning" dimension of tourism imagery in coastal cities. The research technology roadmap is shown in Figure 1.

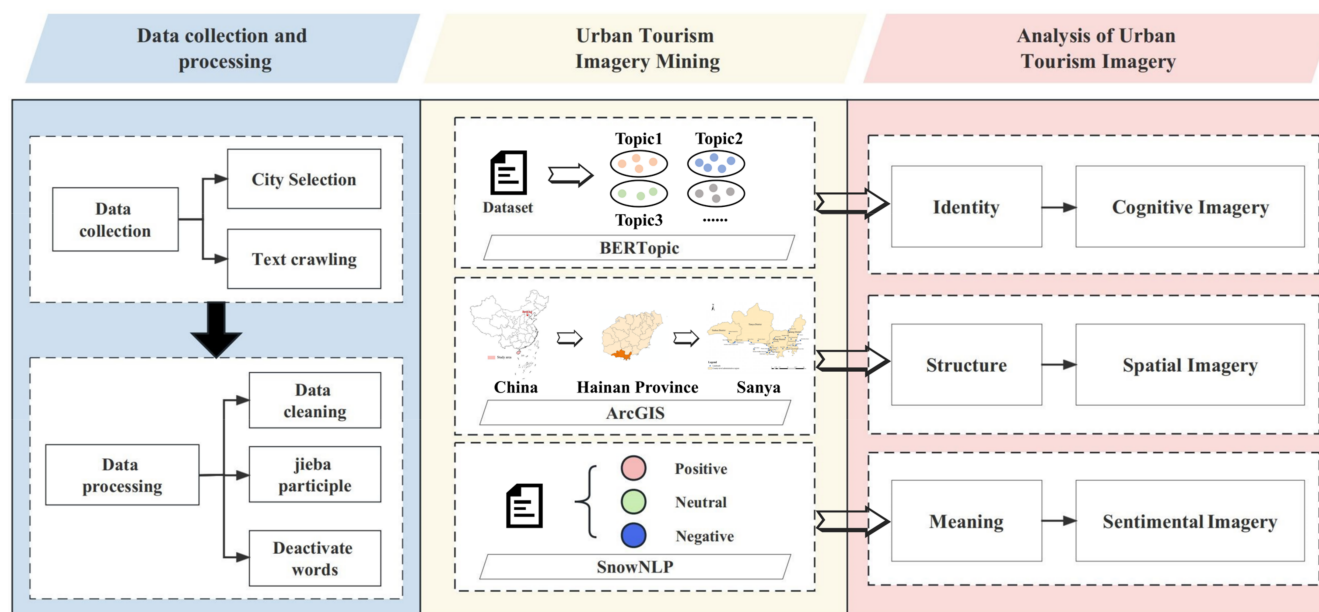


Figure 1. Research framework.

3.2. Study Area

This study focuses on Sanya and investigates tourists' perception of tourism imagery in coastal cities. Sanya is one of the important coastal tourism cities in China, with a unique tropical climate and rich marine tourism resources. Therefore, it attracts a large number of tourists who go on vacation and go sightseeing every year. Sanya is bordered by high mountains to the north and the sea to the south, with a coastline of 258.65 km. It is known as "Eastern Hawaii". Under the favorable policy of building an international tourism consumption center in Hainan Province, Sanya, as the core tourism attraction of Hainan Province, once again ushers in the spring of development. Therefore, Sanya is a representative choice as a case study of the tourism imagery of coastal cities. It can provide some reference for the planning, facility construction, and tourism product development of coastal tourism.

3.3. Data Collection and Processing

With the development of OTA (online travel agent) platforms, the way consumers obtain information through offline travel agencies and other channels has been strongly impacted. With the rapid rise in OTA websites represented by Ctrip, it has become a common choice for many travelers to find travel tips through online platforms before traveling. Ctrip (<https://www.ctrip.com/> (accessed on 31 March 2023)), which is currently the largest travel e-commerce website in China, has a large number of active users and a wealth of travelogues. Qunar Cayman Islands Limited (<https://www.qunar.com/> (accessed on 31 March 2023)) and Journey Never Ends (<https://www.qyer.com/> (accessed on 31 March 2023)) are also famous travel websites. The websites keep complete online travel information and update information quickly, serving as supplementary websites for synchronized data collection.

In this paper, we used "Sanya" as the key search term and the Octopus collector to capture travelogues on travel websites such as Ctrip [51]. The data collection content includes user nicknames, travelogue text, posting time, and other related information. From the period from 1 January 2021 to 31 March 2023, a total of 1113 original travelogues were obtained [52,53]. To extract data about travel in Sanya, the collected content was manually screened according to the following criteria [52]: (1) eliminate travelogues that only have pictures or videos; (2) eliminate duplicates and advertising and marketing types of travelogues; and (3) retain travelogues that only involve records of travel in Sanya. Finally, 523 travelogues were obtained that met the standards, totaling 1,629,981 words. The travelogues were encoded in a "source + order" manner, such as labeling the sixth travelogue obtained from the Ctrip website as C6. By analogy, the xth travelogue from Qunar Cayman Islands Limited was labeled as Qx, and the xth travelogue from Journey Never Ends was labeled as JNEx.

3.4. Methods

3.4.1. Text Topic Identification

Text topic identification is the semantic association analysis of TGC data, which extracts tourists' perceptions of destination cognitive attributes from the text. In this paper, we used BERTopic to deeply mine the topic information of identity elements in travelogues. BERTopic is a topic modeling method based on deep learning, and the model principle is shown in Figure 2.

BERTopic can perform topic modeling on a large amount of text and then cluster the topics to obtain more concise topics [54]. It makes the topics easier to interpret while retaining important vocabulary in the topic descriptions. Using BERTopic to extract topics from travelogue texts can be used to systematically explore the cognitive elements of coastal city tourism. Identifying the identity elements of a city through tourists' cognitive perception of the destination is beneficial to enhance the city's tourism competitiveness, attract more tourists, and promote the development of the city's tourism economy.

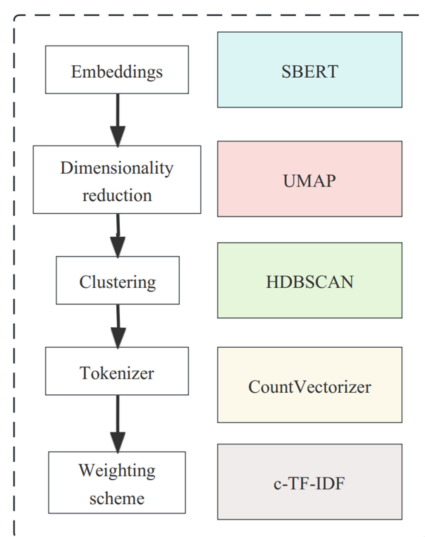


Figure 2. The process of BERTopic.

3.4.2. Spatial Structure Identification

Spatial structure recognition is the visualization and analysis of spatial structures based on travelogue data in TGC, to explore tourists' perception of spatial attributes in cities. The location data information left by tourists on social platforms through text and pictures forms a digital footprint, which records the traces of tourists' presence in the destination.

Firstly, we extracted the high-frequency words related to the structure in the travelogue text and performed keyword recognition for five elements: district, edge, path, node, and landmark. Secondly, we used the "Geocoding" open interface of the Gaode Map JS API 2.0 to obtain the latitude and longitude of each landmark. Finally, we converted the obtained Martian coordinates into WGS 84 coordinates, and used ArcGIS 10.8 to conduct a clear and intuitive spatial visualization analysis of the location distribution of the landmarks.

3.4.3. Sentiment Analysis

Text sentiment analysis is the semantic sentiment tendency analysis of TGC to explore the sentiment tendency of tourists towards destinations. The sentiment analysis method used in this paper is SnowNLP, which calculates the sentimental index of each text based on the sentiment dictionary and then analyzes the sentiment tendency.

The range of sentimental index assignments is 0–1. The closer the score to 1, the more positive the attitude expressed in the text. On the contrary, the closer the score to 0, the more negative the attitude expressed in the text. The sentimental inclination of tourists towards the destination can reflect the meaning of urban tourism imagery, which is conducive to the targeted improvement of urban imagery, thereby enhancing tourists' sense of identity and satisfaction with the city.

4. Results

4.1. Identity

This study utilized BERTopic to extract topics from travelogues in Sanya, resulting in 87 third-level topics. The results of the output topic-representation word part are shown in Table 1.

From the extracted third-level topics, 23 s-level topics were obtained, and 4 types of first-level topics were summarized, namely identity elements (see Table 2). The natural landscape mainly comprises the coastal scenery, tropical flora and fauna, environmental climate, and marine ecosystem of Sanya. The human landscape primarily comprises a culturally distinctive landscape built upon the natural landscape, encompassing Sanya scenic spots, internet celebrity spots, and architectural spaces seen on the way to travel.

Cultural beliefs mainly consist of the film and television culture spread after filming, the unique ethnic culture of ethnic minorities, and the religious culture with a long history. Evidently, the urban tourism imagery of Sanya embodies an “external explicit-internal implicit” attribute. The natural landscape and human landscape of Sanya are the visual cognition of tourists of the objective things and are the “explicit imagery” that tourists can directly perceive. Cultural beliefs such as film and television culture, ethnic culture, and religious beliefs are the perception of imagery hidden in tourism symbols such as customs and Buddha statues, which can be described as the “implicit imagery” residing within the minds of tourists. Based on the visual experience satisfied by the “explicit imagery”, the “implicit imagery” at the spiritual level is integrated, creating physical and psychological resonance for tourists. Social activities include eating, accommodation, transportation, night tours, tourism shopping, and leisure entertainment. The six aspects of accommodation, food, transportation, travel, shopping, and entertainment are integral to the tourist experience.

Table 1. Topic-representation words output by BERTopic (part).

Third-Level Topic	Representation Word
Topic1 Duty-Free Shopping	duty-free store, integral, cosmetics, buy, discount
Topic5 Photography Record	photographer, mobile phone, snap, video, angle
Topic30 Hotel Facilities	sea-view room, hotel, big bed, check in, bathtub
Topic38 Old-Style Buildings	dragon street, fishing village, memorial archway, tianya community, fresh
Topic47 Beach Scenery	coconut tree, coastline, beach, sound of wave, shell
Topic52 Car Rental Matters	car rental, traffic lights, high speed, self-driving, insurance
Topic56 Weather Condition	sky, sunny, sunshine, rain, fresh air
Topic61 Famous Scenic Spots	Luhuitou, Daxiaodongtian, Wuzhizhou Island, Nanshan Cultural Tourism Zone, scenic spot
Topic72 Film and Television Communication	If you are the one, bridge section, Shu Qi, film and television dramas, classic movies
Topic74 Marine Life and Ecosystem	coral reef, a hundred years, protection, marine organism, ecosystem

To summarize, Sanya’s cognitive imagery is the balanced development of the natural and human landscapes. The vast sea area surrounding Sanya boasts gentle beaches and crystal-clear seawater, making it a prime leisure and vacation destination renowned for its tropical ocean scenery. In particular, on islands such as West Island and Wuzhizhou Island in Sanya, not only is the scenery beautiful, but colorful tropical marine fish also appear in the sea, “(Q14) *just like a huge tropical marine ecosystem*”. Sanya is equally beautiful at night. The scorching heat of the day has faded, leaving behind a silent night sky and a refreshing sea breeze.

In addition to the fascinating natural landscape, Sanya also has a diverse array of human landscapes. There are many famous scenic spots in Sanya, including 14 A-class tourist attractions. For example, Wuzhizhou Island, known as “China’s Maldives”, and Betel Nut Valley, the first 5A-level scenic spot of ethnic culture in China, attract many tourists to experience the unique scenery. Sanya’s transportation is also convenient, and tourists can travel to various scenic spots by bus and cab. Convenient methods such as self-driving and car rental are also popular.

Influenced by social media, “internet celebrity punch-in” has become an essential marketing means for tourism destinations. With the “help” of TV dramas and variety shows, Sanya has also appeared in “Internet Celebrity Restaurant”, “Internet Celebrity Road”, and other places. The birth of internet celebrity punch-in places has brought new elements to Sanya tourism, which is more dynamic and attractive than the traditional scenic spots. Yalong Bay Tropical Paradise Forest Park is the main filming location for “If You Are the One 2”, and its fame soared after the film was released. Tourists also imitated the actors’ actions and took photos at the filming location as souvenirs.

Table 2. Identification of personality elements in urban tourism imagery.

Identity Elements	Second-Level Topic	Third-Level Topic
Natural Landscape	Coastal Beauty	Topic31 Night Scenery; Topic47 Beach Scenery; Topic82 Bay Scenery
	Tropical Flora and Fauna	Topic59, 83 Tropical Plants; Topic66 Tropical Fruit; Topic78 Tropical Animals
	Climate Environment	Topic46 Temperature and Dressing advice; Topic56 Weather Conditions
Human Landscape	Marine Ecosystem	Topic74 Marine Life and Ecosystem
	Scenic Spot Scenery	Topic4 Opening Hours; Topic6, 9, 19, 55, 61, and 80 Famous Scenic Spots; Topic57 Ticket Purchase Instructions
	Internet Celebrity Tourism Spots	Topic28 Internet Celebrity Highway; Topic43 Internet Celebrity Restaurant; Topic50, 86 Internet Celebrity Attractions
Cultural Belief	Architectural Space	Topic21, 65, 84 Public Buildings; Topic33, 48 European-style Buildings; Topic35, 38 Old-style Buildings; Topic81 Ancient Buildings
	Film and Television Culture	Topic8, 72 Film and Television Communication
	Ethnic Culture	Topic14 Ethnic Minority Customs; Topic17 QianGuQing
Social Activity	Religious Beliefs	Topic3 Religious Architecture; Topic42 Buddhist Culture
	Accommodation	Topic10, 40 Hotel Recommendation; Topic30 Hotel Facilities
	Diet	Coastal Cuisine
		Local Specialties Cuisine
		Hotel Catering
	Leisure Entertainment	Catering Venues and Facilities
		Service Attitude
		Parent-child Interaction
	Night Tour	Marine Entertainment Projects
		Photo Shooting
		Topic13, 62 Enjoy the Fantasy City; Topic39 Night Life; Topic45 Evening Performance; Topic71 Zhenghe Treasure Boat Night Cruise Sanya Bay
	Tourism Shopping	Topic1 Duty-free Shopping; Topic12, 63, 70 Travel Essential; Topic37, 41 Travel Consumption; Topic75 Duty-free Goods; Topic85 Tourist Souvenirs
	Tourism Transportation	Topic2 Transportation Hub; Topic11 Time Schedule; Topic44 Vehicles; Topic52 Car Rental Matters; Topic58 Transportation Mode; Topic68 Travel Route

Sanya is situated on the southernmost small island in China, with a relatively remote geographical location and well-preserved ethnic minority cultures. At the same time, ancient and old-fashioned structures, as well as some European-style buildings such as churches, have also been preserved. In addition, the Buddhist architecture in Sanya is also very famous. The 108 m high Guanyin on the sea showcases the profound Buddhist and traditional Chinese culture, making it a world-renowned Buddhist destination. Tourists who embrace Buddhism will visit the Nanshan Cultural Tourism Zone, where Guanyin is enshrined, to seek blessings.

Unlike bustling modern cities, Sanya has a slow pace of life and is a place that makes people feel relaxed and comfortable. In Sanya, people can stay away from the hustle and bustle of the city and enjoy a comfortable and leisurely seaside vacation atmosphere. Such a beautiful Sanya has gradually become the preferred place for couples to take photos. The azure sea and the silvery white sandy beaches stretching for more than ten kilometers are popular choices for many newlyweds to take their wedding photos. Due to their moving love legends, Tianyahaijiao, Luhuitou Park, and other sites also become photo records of “sea vows” of love at sacred places.

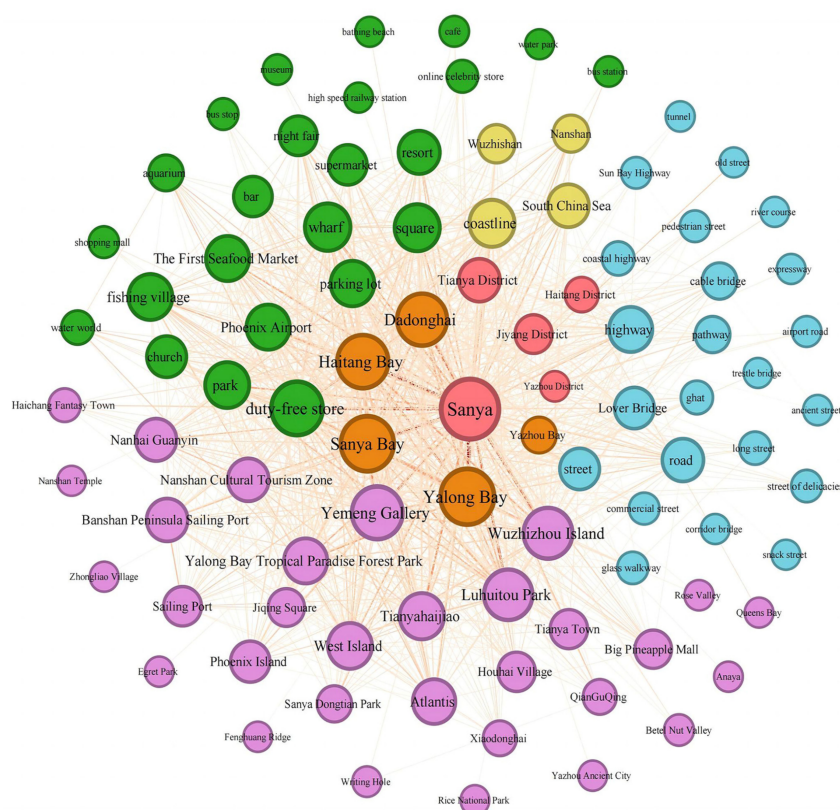
In addition to scenic spots and sea views, Sanya’s seafood and various local cuisines are also deeply loved among tourists. Sanya has abundant seafood resources with diverse practices and delicious flavors. As a mature tourist city, the service attitude of various restaurants is better, which promotes the development of Sanya’s tourism economy. In

As an established coastal tourism city, Sanya's hotel industry is well-developed. Various types of hotels stand by the sea with complete facilities. In summer, some tourists choose to "soak in the hotel and look at the sea" due to the ultraviolet rays during the day. At the same time, the children's entertainment facilities in the hotel are relatively complete and safe, and suitable for parents and children to experience together. Other adventurous tourists choose to engage in a variety of entertainment activities at sea (such as diving and surfing), thereby not only experiencing excitement, but also achieving the effect of relieving heat. In winter, unlike the cold and dry weather in the north, the climate in Sanya is comfortable, warm, and humid. Therefore, many tourists opt to spend the winter in Sanya and avoid the cold in a pleasant environment.

4.2. Structure

A network

butting back



The four urban districts of Sanya possess a clear imagery structure, which includes 5 imagery districts, 4 edges, 23 paths, 24 nodes, and 30 landmarks (see Table 3). Evidently, landmarks, nodes, and paths are the dominant components in the structural elements of Sanya, followed by districts and edges. This differs from the most common combination used to describe the city: paths, districts, and landmarks [55].

Table 3. Extraction of structural elements in Sanya’s urban tourism imagery.

Classification of Structural Elements		Number	Structural Elements (Frequency)
District	Urban District	4	Tianya District (114), Jiyang District (63), Haitang District (55), Yazhou District (12)
	Imagery District	5	Yalong Bay (1363), Sanya Bay (1228), Haitang Bay (967), Dadonghai (598), Yazhou Bay (91)
	Edge	4	Coastline (228), South China Sea (119), Nanshan (192), Wuzhishan (68)
	Path	23	Highway (179), Lover’s Bridge (173), Street (134), Ropeway Bridge (117), Dragon Street (79), Road (68), Sun Bay Highway (60), Glass Walkway (60), Coastal Highway (57), Trail (57), Trestle Bridge (51), Food Street (48), Walking Street (43), Mountain Road (41), Commercial Street (38), Tunnel (32), River (29), Expressway (28), Airport Road (25), Old Street (21), Ancient Street (19), Snack Street (18), Gallery Bridge (11)
	Node	24	Duty-free store (443), Wharf (385), Night Market (330), First Seafood Market (297), Park (264), Square (253), Fishing Village (247), Parking (234), Aquarium (174), Resort (169), Phoenix Airport (165), Water World (126), Supermarket (111), Church (107), Bar (105), café (59), Bus stop (40), Shopping center (39), Museum (37), Water park (35), internet celebrity store (27), High-speed railway station (32), Beach (22), Bus station (15)

4.2.1. District

Districts are areas where there is a high concentration of structural imagery points [56]. The four urban districts of Sanya have formed a total of five imagery districts. The tourism resources of Sanya are mainly connected by the five major bays in the imagery district. From east to west, these are Haitang Bay, Yalong Bay, Dadonghai, Sanya Bay, and Yazhou Bay.

It is evident that tourists’ overall perception of Sanya is relatively concentrated, but the intensity of perception is uneven. Sanya Bay and Yalong Bay are the two imagery districts with a significant tourist perception and are also the core areas driving the development of the tourism industry. Their high popularity has driven the development of their surrounding scenic spots. Haitang Bay and Dadonghai Bay are ranked next, and finally, Yazhou Bay. Yazhou Bay is in the western part of Sanya, with low tourism interest, and is a marginal area for tourism imagery perception.

4.2.2. Edge

Edges are the dividing lines between regions, including various natural or man-made boundary lines, as well as other flexible boundary lines [57]. In terms of dividing the boundaries of imagery districts, four edges were formed, namely, the coastline, the South China Sea, Nanshan, and Wuzhishan. It can be found that mountains and rivers have the most significant effect on separating imagery districts, while roads have little influence on imagery districts.

4.2.3. Path

Paths link tourists’ routes and represent the perception of spatial movement paths during the tour [58]. From the entire research area, Sanya formed 25 main imagery paths. These paths constitute the channels through which the nodes, landmarks, and even districts communicate with each other.

In the results of structural element identification, the terms related to paths include road (such as coastal road, airport road, and highway); street (such as dragon street, food

street, and commercial street); bridge (such as lover's bridge, rope bridge, and trestle bridge); and trail (such as glass trestle, tunnel). The intensity of perception was ranked as follows: road (37.1%) > street (28.8%) > bridge (25.4%) > trail (8.7%). It can be seen that visitors' perception of the "road" is the strongest. The Sun Bay highway, coastal highway, and other roads have beautiful scenery and are rich in coastal customs. They reflect tourists' recognition of the good road conditions and the spatial perception of the comfortable environment in the coastal city. Secondly, the tourist's perception of "street" is also very strong. Dragon street, old street, and ancient street express tourists' recognition of the ancient island's cultural connotations contained in the road space. Modern titles such as food street, pedestrian street, commercial street, and snack street reflect tourists' perception of the degree of commercialization in Sanya. In addition, although the frequency of the appearance of "bridges" and "trails" is slightly lower than that of other structural elements, they are abstract expressions of tourists' perception of the romance, leisure, and other artistic conceptions of Sanya, and form their perception of the romantic atmosphere of coastal cities.

4.2.4. Node

Nodes are strategic intersections in cities that allow visitors to stay and connect with their surroundings [59]. Based on the recognition results of structural elements, 24 node terms were extracted. Among these, duty-free stores are the nodes that tourists have the most contact with. Since the implementation of the duty-free shopping policy in Hainan Province, the popularity of "duty-free" has remained high, promoting the rapid development of Sanya's tourism economy. Airport, wharf, parking, high-speed railway station, and bus station represent the transportation hubs and types of infrastructure that tourists encounter during their travels and play an essential role in the tourism service system. In addition, visitors can find space for viewing, resting, and recreation at nodes such as aquariums, parks, churches, and museums. Nodes such as night markets, supermarkets, and bars can meet visitors' consumption needs to varying degrees.

4.2.5. Landmark

A landmark is a reference point for tourists to recognize destinations and determine the identity of cities [60]. A total of 30 landmarks exist in the research area, and the spatial distribution map is shown in Figure 4. It can be seen that the imagery landmarks of Sanya form two high-density areas in Sanya Bay and Yalong Bay. The clustering phenomenon of landmarks in the coastal area is remarkable, and is in line with the landscape distribution characteristics of coastal cities.

The ranking of the appearance frequency of landmarks not only shows the perceived strength of tourists towards the unique attractions, but also reflects the popularity of the destination's landmarks. The islands such as Wuzhizhou Island, West Island, and Phoenix Island are the landmarks with the strongest perception of tourists, representing the coastal tourism characteristics of Sanya and becoming the preferred attractions for tourists. As famous religious buildings in Sanya, Nanhai Guanyin and Nanshan Temple have attracted a large number of tourists to wish and pray for blessings. Luhuitou Park, Tianyahaijiao, Yazhou Ancient City, and other classic architecture in Sanya, with their iconic and symbolic architectural properties, have a direct visual impact on tourists. Famous scenic spots such as Qiangquing, Yalong Bay Tropical Paradise Forest Park, and Betel nut valley are both ornamental and entertaining, and are important ways for tourists to perceive the spatial imagery of Sanya. Some tourists prefer to choose internet-famous landmarks such as Anaya and Jiqing Square for punch-in. Additionally, visitors have a strong perception of towns or bays such as Tianya Town, Houhai Village, and Queens Bay, demonstrating that the spatial presence of the tourism experience reflecting island life has deeply impacted visitors.

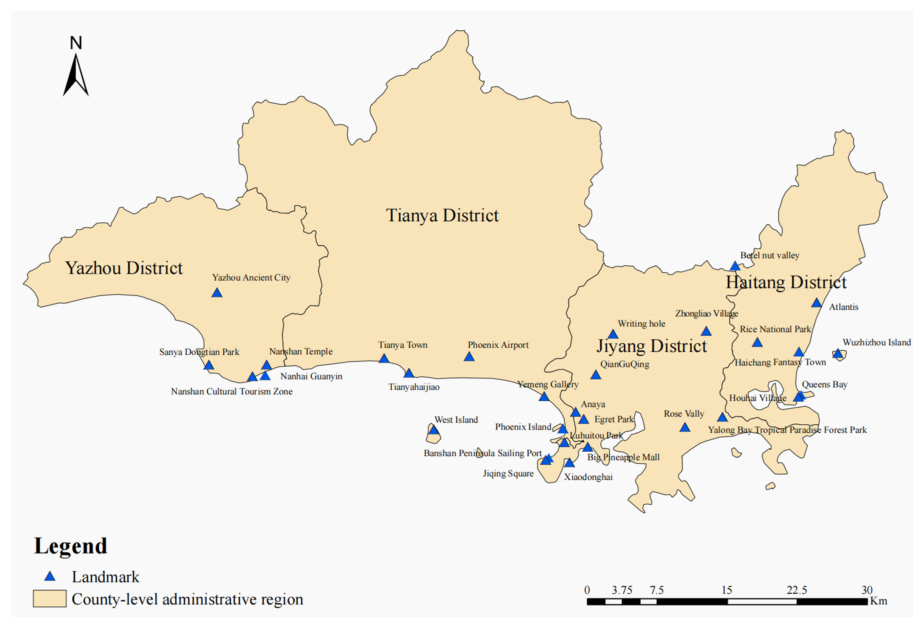


Figure 4. Spatial distribution map of landmarks in Sanya.

4.3. Meaning

Firstly, we divided the text into sentences and deleted sentences with fewer than eight words. Secondly, we used SnowNLP to perform sentiment analysis on the processed statements. We used a naive Bayesian model to calculate the sentimental index. Positive sentiment was defined as having a sentimental index greater than 0.6, negative sentiment as having an index less than 0.4, and neutral sentiment as having an index between 0.4 and 0.6 (see Figure 5).

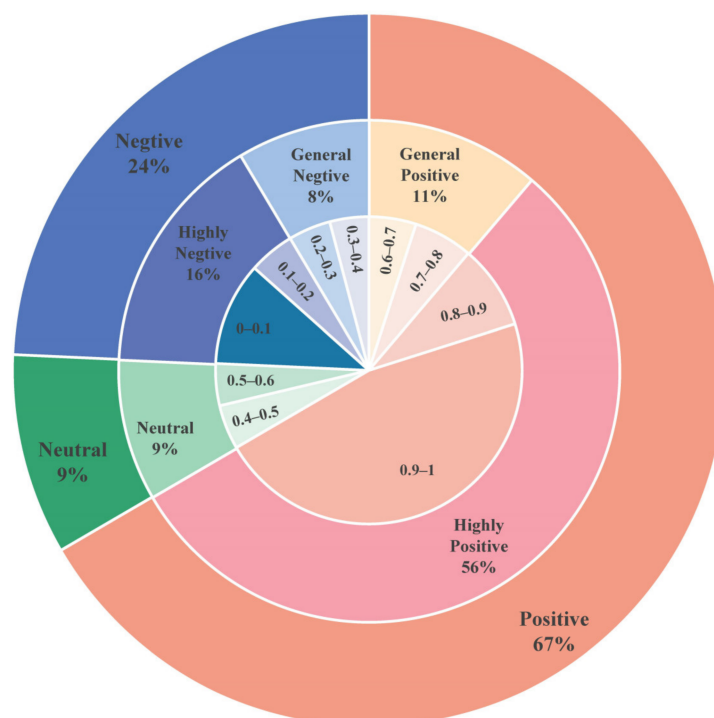


Figure 5. The proportion of sentimental tendencies in travelogues. Note: From an overall perspective, Figure 5 consists of three emotions: positive, negative, and neutral, represented by three color schemes: red, blue, and green, respectively. The red section represents positive emotions; the blue represents

negative emotions; and the green represents neutral emotions. In terms of specific composition, Figure 5 can be divided into three layers from inside to outside: the first layer is the emotion score; the second layer is the emotion subdivision category; and the third layer is the emotion tendency. Taking positive emotions in the red color section as an example, the proportion of positive emotions in the emotional tendency chart is 67%, with 56% being highly positive (emotional scores ranging from 0.6 to 0.8) and 11% being generally positive (emotional scores ranging from 0.8 to 1).

Overall, tourists' sentiments towards Sanya are polarized. Among these, positive sentiments accounted for the highest proportion, at 67%; negative sentiments took second place, accounting for 24%; and neutral sentiments only accounted for 9%. Content analysis on the travelogues was performed after sentiment classification, and keywords were extracted from relevant texts, as shown in Table 4.

Table 4. Extraction of meaning elements in Sanya's urban tourism imagery.

Sentimental Classification	Keywords	Sentimental Classification	Keywords
Highly positive sentiments	Beautiful scenery Warm winter weather Rich entertainment activities Relaxed atmosphere	Neutral sentiments	Travel transportation Scheduling Scenic area introduction Duty-free shopping
	Good service attitude Good value for money accommodation	Highly negative sentiments	High consumption Serious commercialization
General positive sentiments	Good food	General negative sentiments	Crowded
	Beautiful expectations Rich nightlife		More mosquitoes and insects Uncertain weather conditions in summer

Highly positive sentiments are mainly manifested in six aspects: beautiful scenery, warm winter weather, rich entertainment activities, relaxed atmosphere, good service attitude, and good value for money accommodation. Sanya's sea view, pleasant climate, and relaxing atmosphere can directly affect tourists' sentimental experience. Rich and interesting sea entertainment activities will also enhance tourists' positive sentiments, such as "(C201) *It is recommended to play all the sea projects, including underwater walking, diving, sea paragliding, surfing, etc., which is absolutely very exciting*". The added value of entertainment activities for tourists' sentiments is fully reflected. In addition, the perfect hotel facilities and good service attitude will also have a positive impact on the sentimental image of Sanya.

General positive sentiments are mainly expressed in three aspects: delicious food, beautiful expectations, and rich nightlife. Combining the highly positive sentiment and the general positive sentiment shows that Sanya has received high praise from tourists in terms of food, accommodation, and entertainment.

The neutral sentimental sentences mainly describe the records of tourism transportation, itinerary arrangements, scenic area introductions, duty-free shopping, and other aspects. As mentioned in the text, "(C65) *There are intercity line 2 buses that can be taken from the city, with a ticket price of 20 yuan*".

Tourists exhibit a high level of dissatisfaction with expensive consumption, severe commercialization, and overcrowding. As commented in the text, "(C168) *The price twice higher than the seafood market immediately scared me out*"; "(C122) *This is a place with a sea of people, and even today is a workday, there are quite a few tourists*". These texts reflect the shortcomings of Sanya, such as high prices, inadequate management, and improper arrangement of the number of visitors to the scenic area.

General negative sentiments mainly express unhappiness about the weather, with many mosquitoes and uncertain weather occurring in summer. To address general negative sentiments, scenic spots and hotels can prepare mosquito repellent sprays, umbrellas, and

other items, and remind tourists to carry them. A good service remedy can alleviate or even eliminate general negative sentiments and transform them into positive sentiments.

5. Discussion and Implications

Motivated by the lack of understanding of coastal tourism imagery at the urban level, we applied a series of text analytics techniques to explore tourist perceptions in online travelogues. The research results indicate that the development of natural and cultural landscapes in Sanya is balanced, in line with the community-based ecotourism model in the blue economy [61]. At the same time, the urban tourism imagery of Sanya exhibits an “external explicit-internal implicit” attribute, which is consistent with previous research on the imagery of Sanya [51]. In terms of structure, this study used Lynch’s five-element classification to analyze the structural imagery of Sanya. We found that the imagery district exhibited a polarization effect of high tourism heat in Sanya Bay and Yalong Bay, but low heat in Yazhou Bay, which is in line with the core–edge theory of urban regional development [62]. In addition, this study found that the main elements in the structural image of coastal cities are landmarks, nodes, and paths, which is different from Tang’s conclusion about the spatial distribution of mega cities [55]. In terms of meaning, this study divides the emotions that affect tourist satisfaction into five categories: highly positive, general positive, neutral, highly negative, and general negative, further refining previous research on the emotional aspects of destination imagery [14,50]. At the same time, this study combined the research framework of “identity-structure-meaning” to realize an all-around examination of the destination image, which provides a theoretical background for image branding research and landscape planning research in coastal cities [24,63].

5.1. Implications for Research

This study contributes to the existing body of knowledge in three main ways. First, this study explores the tourism imagery of coastal destinations from a macro perspective at the city level, enriching the research framework of destination imagery. Examining urban tourism imagery from the perspective of tourists is crucial to creating an urban space and environment that is economically vibrant and regionally distinctive [64]. However, most imagery perception studies tend to equate coastal cities with general tourist destinations, ignoring the characteristics of cities [27,28]. Therefore, this study introduces the theory of urban imagery into coastal destination research, deepens the exploration of the relationship between cities and tourism in previous studies, and provides a theoretical basis for the sustainable development of tourism in coastal cities [26,33].

Second, previous research on urban tourism imagery perception tends to rely on “small data” for exploration, mainly using traditional data collection methods such as questionnaire surveys and interviews, neglecting the information advantage of TGC [20]. Therefore, this study used TGC data to mine large-scale tourist perceptions and help discover themes and emotions that may be overlooked in small data, thus providing a more comprehensive understanding of the perception status of urban tourism imagery [22]. In addition, compared to methods such as LDA and PLSA, the deep learning method using BERTopic in this study can be used to more accurately mine the urban tourism imagery in tourists’ perceptions [26].

Finally, based on the analytical framework of “identity-structure-meaning”, this study explores the urban imagery perceived by tourists, expanding the research scope of coastal tourism and urban imagery. With the recovery of tourism, coastal tourism will face a bright development prospect [65]. Therefore, this study lays the foundation for further research on coastal tourism and encourages scholars to explore the interaction between tourists and coastal cities.

5.2. Implications for Practice

On the one hand, as a typical coastal tourism city in China, Sanya still has room for improvement in imagery planning and promotion. First, destination marketing organiza-

tions should focus on shaping urban personalized brands. Creating a unique impression of a coastal city can strengthen tourists' sense of identity and attachment to the destination, which drives tourists to generate behaviors such as purchasing and revisiting [51]. Second, Sanya has an imbalanced structure of the tourist flow network, which will affect the development space of other imagery districts. Therefore, destination managers should develop reasonable plans for the location distribution of attractions to achieve the driving effect of the core area on the marginal areas [62]. Third, destination staff should maintain a positive and friendly attitude, especially in service attitudes and hotel accommodation. Fourth, government authorities and destination managers should strengthen the price control of tourism spending at various attractions and rationalize the number of tourists visiting scenic spots to cope with factors that make tourists dissatisfied, such as high spending and overcrowding. At the same time, scenic spot managers should strengthen the construction and management of tourism infrastructure, such as measures for mosquito, rain, and heat stroke prevention, to reduce tourists' negative emotions.

On the other hand, this study provides some insights for marketing in other coastal cities. Concerning identity, coastal cities cannot ignore the construction of a spiritual civilization while improving the imagery of natural and human landscapes. Destination marketing organizations can enhance tourists' sense of local identity and dependence by promoting local distinctive culture and conducting cultural tourism [66]. Structurally, the government departments of coastal cities should adjust their urban planning and expand cooperation between destinations with high tourism intensity and surrounding areas to drive the development of the entire region. It can also introduce new landscapes or popular online attractions in areas with low tourism awareness, injecting new vitality into the city. In terms of meaning, the destination staff should always pay attention to tourist satisfaction and promptly address issues that trigger negative emotions. In case of service failure incidents, staff should prepare a service remediation plan in advance in order to minimize visitors' negative emotions [67]. In addition, managers of scenic spots need to regularly inspect tourism infrastructure to safeguard the daily needs of tourists. At the same time, coastal city managers should control the more commercialized sites and restore the "authentic" coastal tourism experience [2,68].

6. Conclusions, Limitations, and Future Research

This study combined big data and deep learning to evaluate the perception of three-dimensional imagery of "identity-structure-meaning" in coastal cities. First, the BERTopic deep learning model was used to extract tourists' cognitive imagery of Sanya and obtain the identity elements of the city. The results indicate that the identity imagery of Sanya includes 23 secondary topics, which are refined into four dimensions: natural landscape, cultural landscape, cultural belief, and social activity. The urban tourism imagery of Sanya contains the attribute of "external explicit-internal implicit". Among these dimensions, the natural and cultural landscapes are developed in a balanced manner. Second, the spatial image carried by the travelogue was analyzed using ArcGIS to identify the structural elements of the city. The four urban areas of Sanya have a clear imagery structure, with an overall core-edge diffuse distribution. In tourists' perceptions, mountains and rivers have the most obvious influence on the division of imagery areas, the strongest path perception is of roads and streets, the most contact is with nodes of duty-free stores, and the highest intensity of perceptions is of islands such as Wuzhizhou Island and West Island, which reflect tourists' spatial perception of Sanya's comfortable environment, the coastal featured landscapes, and cognitive perceptions of duty-free shopping. Finally, SnowNLP was used to identify the sentimental imagery of tourists and obtain the urban meaning elements. The results indicate that tourists' overall sentiments towards Sanya have become polarized. Although the perception of meaning mainly comprises positive sentiments, negative sentiments, which account for nearly a quarter of the total, should not be ignored. Expensive consumption, severe commercialization, overcrowding, and other problems that cause tourists' dissatisfied emotions need to be addressed urgently.

Although this study provided significant theoretical contributions to the literature and policy issues, there are still some limitations worth discussing. First, this study only selected online travelogues for urban tourism imagery analysis, and its data types are not comprehensive. Future research can integrate multimodal data such as pictures and videos to analyze the tourism imagery of coastal cities. Second, this study used data mining methods to obtain specific research results on the tourism imagery of coastal cities. However, there are certain limitations in understanding the psychological mechanisms underlying the formation of perceptual imagery. In the future, methods such as social network analysis and meta-analysis can be used to deeply explore this point, thereby enriching the research conclusions of urban tourism imagery [69,70]. Third, this study selected post-pandemic travelogues to analyze the urban tourism imagery of Sanya and only showed the results of tourist perception in the past two years. Future research can select travelogues before and after the pandemic for comparative analysis, exploring the diachronic evolution process of coastal city tourism imagery and the impact of COVID-19 on urban imagery. Finally, this study selected Sanya as a case site to explore tourists' perceptions of tourism imagery in coastal cities. However, the small sample size of a single coastal city limits the applicability of the research results [71]. In the future, multiple TGCs of coastal cities can be selected to deepen the study of perceptual imagery. Alternatively, coastal cities from different countries can be selected to compare and analyze urban tourism imagery, exploring the impact of geographical location, ethnic culture, and other factors on tourists' perception of imagery.

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