British Journal of Multidisciplinary and Advanced Studies,7(6),1-22 2026

Business and Management Sciences

Print ISSN: 2517-276X

Online ISSN: 2517-2778

https://bjmas.org/index.php/bjmas/index

Publication of the European Centre for Research Training and Development -UK

Tourism Potential Index Mapping for Underdeveloped Historical Sites in South West Nigeria: A GIS-Based Suitability Model

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doi: https://doi.org/10.37745/bjmas.0623 Published November 09, 2026

Citation: Folorunsoa S.S. and Folorunso O.E. (2026) Tourism Potential Index Mapping for Underdeveloped Historical Sites in South West Nigeria: A GIS-Based Suitability Model, *British Journal of Multidisciplinary and Advanced Studies*,7(6),1-25

Abstract: *Historical and cultural heritage sites in Southwest Nigeria have immense potential for tourism development but remain underdeveloped due to poor infrastructure, accessibility, and investment prioritization. While previous studies have documented the preservation problems and the state of sites, a systematized approach to site identification with the highest potential for tourism development has been lacking. This study develops a Tourism Potential Index (TPI), a GIS-based suitability model that ranks historic sites by their readiness for tourism investment. The model was built using ArcGIS Pro and was based on spatial criteria of site condition, accessibility from the road network, proximity to urban centers and transport hubs, available infrastructure, and cultural or historical importance. The criteria were weighted using the Analytic Hierarchy Process (AHP). They were combined through Multi-Criteria Decision Analysis (MCDA) to derive a composite suitability score per site. Twenty-six historic and cultural heritage sites were identified across the six states of Southwest Nigeria and profiled according to the managing authority, site condition, and immediate infrastructural context. The index classifies sites into different priority categories, from immediate investment to infrastructural development or even long-term conservation. This study goes beyond descriptive assessment by translating data on condition and accessibility into an explicit, spatially referenced decision support tool to enable policymakers, tourism boards, and heritage managers to prioritize scarce resources. The findings promote a more strategic and evidence-based approach to tourism planning in Southwest Nigeria, thus enhancing the sustainable conservation of heritage and unlocking the socio-economic benefits of tourism at hitherto neglected historic sites.*

Keywords: Tourism Potential Index (TPI), GIS; Heritage Sites, South West Nigeria, Multi-Criteria Decision Analysis (MCDA), Analytic Hierarchy Process (AHP), suitability modeling, cultural heritage, geospatial mapping, tourism planning

INTRODUCTION

The importance of preserving historical sites lies in their role as tangible links to the past, providing insights into the history, traditions, and societal development of a region (Letellier & Eppich 2015). However, many historical sites are under threat due to various factors including urbanisation, encroachment, natural deterioration, and vandalism (Elsayed 2020), making the need for systematic documentation all the more critical. Without proper documentation, significant portions of historical and cultural information, along with physical remnants risk permanent loss.

Geospatial mapping plays a crucial role in ensuring the preservation and accessibility of historical sites. It enables accurate recording of site locations, spatial relationships, and physical attributes (Saygi et al. 2013). Application of technologies like GIS, satellite imagery, aerial photography, and other sources of spatial data has significantly improved the ability to collect, analyse, and visualise information about historical sites and their surrounding landscapes (Folger 2010; Wang et al. 2019). This integration allows the incorporation of historical records, archaeological results, and photographic materials, leading to a holistic and multidisciplinary approach to heritage documentation and management (Koller et al. 2010). These methodologies promote greater engagement among the general population through interactive and map-based platforms aimed at exploring and understanding historical sites. This enhances both heritage awareness and the possibilities for heritage-focused tourism and education activities (Jamal & Stronza 2009).

Southwest Nigeria has many unique characteristics that make it suitable for undertaking such research. It has one of the most diverse populations in Nigeria consisting primarily of the indigenous Yorubas (Adebanwi 2018), and also has an interesting historical past marked by the rise and fall of several powerful empires as well as some notable city states. Also, the region was located strategically within key trade routes throughout history which explains the diversity in its rich heritage of culturally significant sites ranging from the scenic beauty of the natural landscape to those with historic architectural features such as the famous Idanre Hills in Ondo state which are on the UNESCO world Heritage tentative list owing to their well-preserved architecture and sacred shrines (UNESCO 2015).

Despite having a remarkable array of historical heritage sites, there appears to be an alarming lack of adequate documentation and maintenance strategies, and consequently these important landmarks are mostly devoid of participation in formal tourism development and investments. In light of the aforementioned scenario, this study therefore seeks to provide a spatial assessment methodology through the integration of cultural heritage information with geospatial data to enable better understanding of the potentials for documentation and management of historical sites in Southwest Nigeria. Ultimately, such studies will assist stakeholders in formulating effective heritage conservation strategies while enabling enhanced tourism planning for economic development.

Cultural Significance of South West Nigeria

South West Nigeria has great cultural significance not only within Nigeria but globally, contributing significantly towards various areas such as art, literature, music and religion (Ezenagu, 2020). There are several elements which contribute towards this status of recognition such as the vibrant cultures and traditions belonging to the Yoruba ethnic group. The Yoruba culture is very unique with well-preserved cultural heritage characterized by vibrant traditional customs, rich oral histories, numerous festivals, and exquisite crafts (Oloidi, 2014). Some aspects of the Yoruba Culture include their rich oral tradition featuring different kinds of myths, legends, and proverbs forming part of their cultural

identities along with their languages, types of music they create, forms of dance practiced, and religious beliefs centered around the orisha's (deities) (Falola, 2001; Murrell, 2010).

South west Nigeria is renowned for having remarkable artistic expressions through various works of art ranging from wood carvings, bronze castings, and beadworks among others while textile artists produce exquisitely dyed cloth using the resist-dyeing technique called adire (Blier, 2012). Notably, there are other interesting architectural styles represented in buildings made out of mud bricks whose layout contains courtyards as can be seen in older towns such as Oyo and IFE. Furthermore, colorful festivals held in different parts of Southwest Nigeria such as Osun-Osogbo, Ogun, and Eyo amongst others, draw many tourists yearly from all over world (Fadele, 2019; Mathias, 2014).

Also playing a vital role in the society are some traditional institutions which are headed up by powerful rulers known as oba and serve important functions in areas concerning governance, conflict-resolution, and preserving our cultural heritages (Nweke, 2012). Additionally, South-west Nigeria houses quite a number of significant historical locations representing the region's cultural heritage such as the ancient city-state of Ife, Osun-Osogbo sacred grove, a UNESCO world heritage site, and slave trade relics at Badagry etcetera (smith, 1988).

Role of Geospatial Mapping in Heritage Documentation

Satellite imagery, aerial photography, and LiDAR data play an essential role in identifying and documenting historical sites that might otherwise remain unnoticed due to natural concealment or time decay (Ginzarly et al., 2019). Mapping historical sites onto digital platforms enables researchers, historians, and visitors alike to appreciate their exact location and how they relate spatially with surrounding features, such as rivers, mountains, and other landmarks (Johnson & Ouimet, 2014). Geospatial mapping helps preserve, conserve and interpret our heritage because it facilitates the study of cultural landscapes by integrating land cover, vegetation, and topography data, helping situate sites more precisely in their broader contexts (Cetin, 2016).

Further still, geospatial mapping aids in preserving and conserving sites by allowing planners to map and monitor environmental parameters impacting them such as erosion risk zones, vegetation encroachment, or urban development pressures as well as offering interactive ways for members of the public to engage virtually with heritage sites through maps, virtual reality experiences, or mobile apps geared towards education and tourism (Cayla, 2014; Caquard et al., 2009; Hritz, 2014; Randolph, 2004). With all this combined power at one's fingertips, no wonder why so many heritage managers look forward excitedly whenever there are opportunities for greater engagement using geospatial analytical tools.

Most Geographic Information Systems (GIS) investigations addressing heritage sites in Nigeria, thus far, have predominantly revolved around documentation and assessments of the condition of these sites (Maduekwe, 2021; Onyima, 2016). We seek to bridge this knowledge gap by developing and employing a composite Tourism Potential Index across our cataloged collection of historical sites located within South West Nigeria

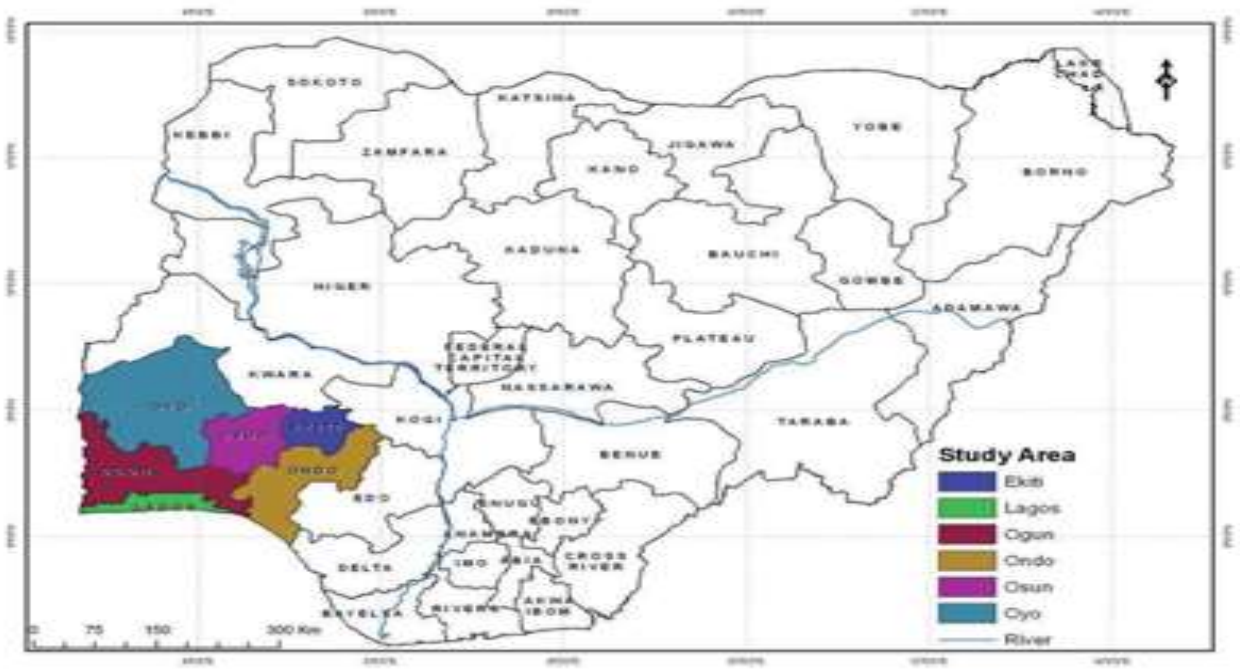
Finally, geospatial mapping technology allows researchers to integrate historical maps and archival documents with other types of geospatial data to better understand how these sites were developed and changed over time and the various cultures that influenced them (Liu & Yang 2017). Through these integrations, researchers are able to achieve deeper insights into the historical significance of the site and its position within history.

In conclusion, geospatial mapping is a powerful technique used in identifying, documenting, preserving, and researching historical sites. The technology provides spatial context for site investigation, aiding conservation planning while facilitating greater public engagement and promoting a deeper appreciation for historical and cultural values associated with them. Although there has been an increase in technological developments relating to geospatial mapping, there exists an apparent lacuna in terms of the utilization of spatial suitability modeling approaches to inform the prioritization of tourism investments towards historically significant but underdeveloped heritage sites.

MATERIALS AND METHOD

Study Area

The study area encompasses the southwestern region of Nigeria, which consists of six states: Ondo, Osun, Oyo, Ekiti, Lagos, and Ogun. This region is divided into one hundred thirty-seven (137) Local Government Areas (LGAs), with Ondo state containing eighteen (18) LGAs, Osun state comprising thirty (30) LGAs, Oyo having thirty-three (33) LGAs, Ekiti state with sixteen (16) LGAs, Lagos state with twenty (20) LGAs, and Ogun state also with twenty (20) LGAs. The accompanying map highlights the southwest region of Nigeria, characterized by its range of landscapes from coastal areas along the Atlantic Ocean to rolling hills and lush forests inland. Prominent cities within this region include Lagos, recognized as Nigeria's economic hub, Ibadan, the largest city in West Africa, as well as Abeokuta and Akure. The region's coastal lowlands transition to inland hills and forests, featuring key urban centers such as Lagos, Ibadan, Abeokuta, and Akure, which serve as reference points for analyzing accessibility and proximity within the region.



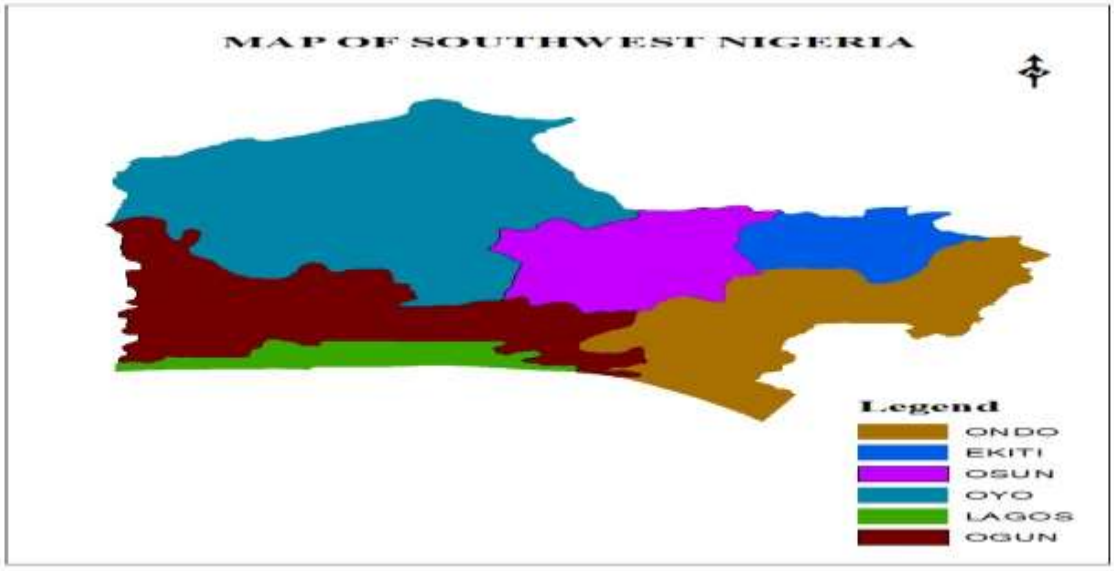


Figure 1. Administrative boundary of the South West Nigeria (Source: Federal School of Survey GIS laboratory and Manipulation by Authors 2026)

Research Design and Methods

This study employed a descriptive, cross-sectional, GIS-based suitability assessment design was used to evaluate the tourism development potential of historically and culturally significant but underdeveloped sites in South West Nigeria. Analysis units were individual heritage sites while research population consisted of all sites catalogued in the course of office and field reconnaissance activities undertaken among the region's six states. From this sample of 26 sites possessing complete attribute records, we obtained a final dataset containing no exclusion based on an inability to resolve location coordinates or verify site management and condition status at the time of data capture.

Data collection and analysis was guided by five primary design elements that were fixed prior to undertaking data collection. These included: (i) Materials/data layers required (administrative boundary, road network, settlement, site-attribute); (ii) Exposures of interest operationalised via site-level management authority category (government/traditional ruler/individual/private) and site condition status; (iii) Measurements (geographic co-ordinates, site condition, management authority, year of establishment and inventory of supporting amenities within a specified km radius); (iv) Data collection procedures (office reconnaissance followed by field ground truthing using differential and hand-held GPS); and finally (v) The data analysis plan (descriptive tabulation of site attributes; test of association between management authority and condition status; and spatial overlay of site accessibility/infrastructure and heritage condition layers to determine composite suitability. A schematic summary of the whole experiment's methodology is presented in figure 2 below.

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https://bjmas.org/index.php/bjmas/index
Publication of the European Centre for Research Training and Development -UK

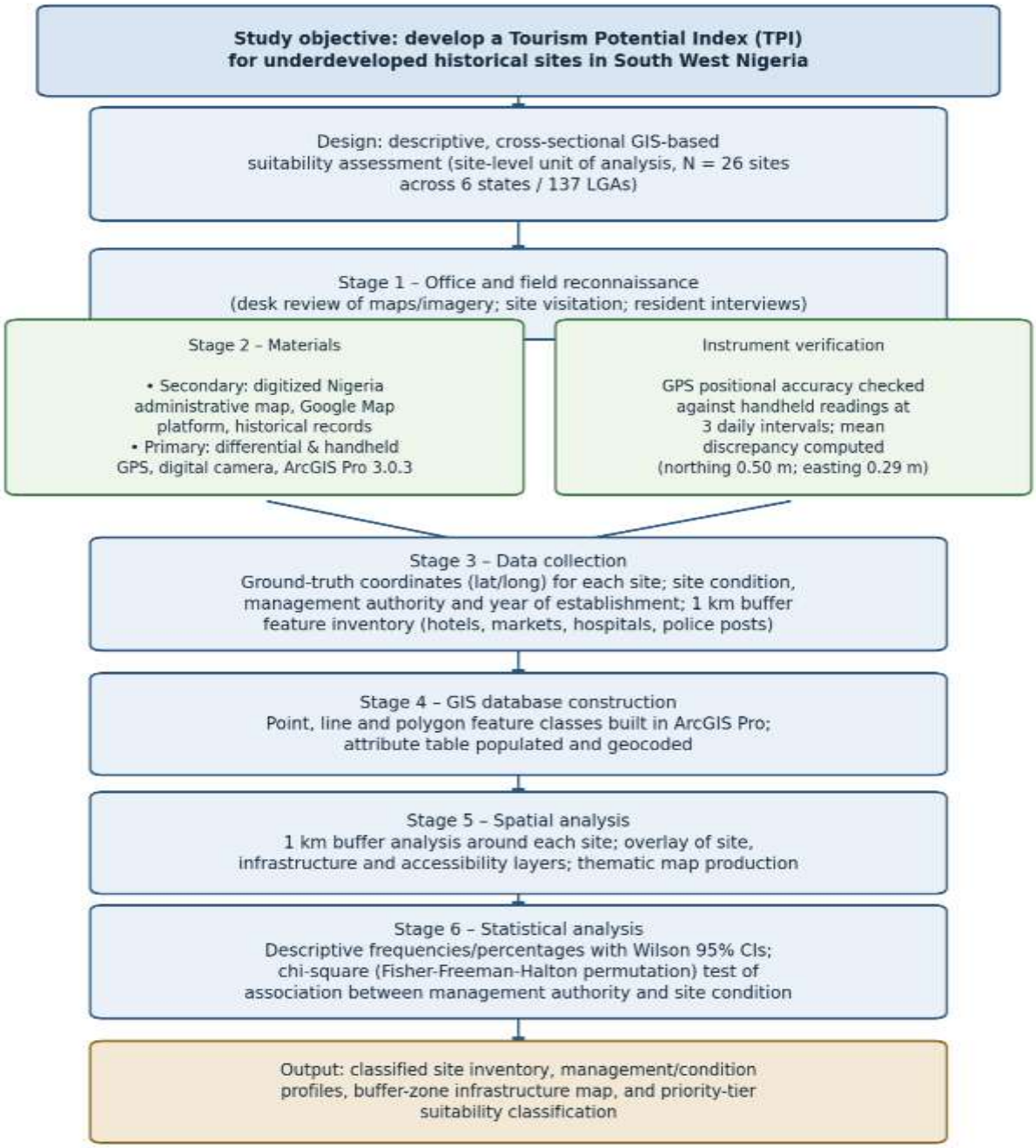


Figure 2. Flowchart of the experimental design, showing materials, treatments/exposures, measurements, data collection stages, and the analysis plan. (Source: Notebook AI and Manipulation by Authors 2026)

The intended composite suitability score for each site j was defined as a weighted linear combination of standardised criterion layers see (Equation 1), where wi is the relative weight assigned to criterion i and xij is the reclassified suitability value of criterion i at site j:

$$TPI_j = \Sigma_{i=1}^{n} (w_i \times x_{ij}) \qquad \text{(Equation 1)}$$

The equation presented above represents our analytical model which the design has been developed around such that this weight for each criterion may be reproduced and refined in future work. Under Statistical Analysis, we describe both the descriptive and inferential analyses carried out according to this design using the current 26-site dataset. There are five separate criteria by which sites were judged in this study including their general site conditions, degree of accessibility via the roads, location relative to urban centres and transport hubs, status in terms of existing infrastructure and degree of cultural/historical significance.

AHP Criterion Weighting

Criterion weights (wi) were derived using Saaty's (1980) Analytic Hierarchy Process (AHP), following the approach described by Elfadaly et al. (2018) and Nsanziyera et al. (2018) in comparable GIS heritage-suitability studies. Because an independent expert panel was not available for the present iteration of the study, pairwise judgements were inferred from the relative emphasis accorded to each criterion in the published literature on GIS-based tourism and heritage suitability modelling. This derivation is stated explicitly here in place of presenting the weights as elicited from a local expert panel; subsequent work should verify and, where necessary, revise the weights through formal elicitation with heritage managers, tourism-board officers, and spatial planners.

Five criteria were evaluated: site condition (C1), road network accessibility (C2), proximity to urban centres and transport hubs (C3), existing infrastructure (C4), and cultural or historical significance (C5). Drawing on the reviewed literature, site condition and road network accessibility were judged to be moderately more important than proximity to urban centres and existing infrastructure for initial investment prioritisation, while cultural or historical significance was treated as broadly comparable in importance to accessibility, consistent with the dual tourism and heritage mandate of the index. The resulting pairwise comparison matrix and derived weight vector are presented in Table 1.

Table 1. AHP pairwise comparison matrix and derived criterion weights for the Tourism Potential Index (TPI).

Criterion	C1	C2	C3	C4	C5	Weight (w_i)
C1 Site condition	1	2	3	3	2	0.30
C2 Road network accessibility	1/2	1	2	2	2	0.24
C3 Proximity to urban centres / transport hubs	1/3	1/2	1	1	1/2	0.14
C4 Existing infrastructure	1/3	1/2	1	1	1/2	0.14
C5 Cultural-historical significance	1/2	1/2	2	2	1	0.18

CR = 0.04 (acceptably consistent, CR < 0.10) (Source: Field Survey and derived by the authors, 2026)

The consistency ratio (CR) of 0.04 is below the Saaty threshold of 0.10, indicating that the pairwise judgements are acceptably consistent. Site condition received the highest weight (0.30), reflecting its direct influence on visitor experience and on the scope of investment required before a site can be

opened to sustainable tourism. Road network accessibility was weighted second (0.24), recognising that even a site of exceptional significance cannot attract visitors without reliable physical access. Cultural or historical significance was assigned a weight of 0.18, positioning it above proximity to urban centres and existing infrastructure (0.14 each), consistent with the finding in Elfadaly et al. (2018) that intrinsic heritage value is a necessary, if not sufficient, condition for tourism viability. The resulting TPI score for each site represents a weighted composite of its reclassified performance across these five dimensions.

Materials and Data Sources

Table 2 lists the data types, formats, and sources assembled for the study. Secondary data, comprising the digitised national administrative map, basemap imagery, and historical and archival records, were combined with primary data collected by the research team during site visitation in 2025.

Table 2. Data types, formats, and sources used in the study.

S/N	Segment	Data type	Source	Date
1	Secondary data	Digitised administrative map of Nigeria	DIVA-GIS (divagis.org)	2025
2	Secondary data	Basemap / satellite imagery	Google Maps Platform	2025
3	Secondary data	Historical and archival information	Published records and online archives	2025
4	Primary data	Site photographs and condition records	Field site visitation	2025

(Source: Field Survey and derived by the authors, 2026)

The hardware included a differential GPS unit, a handheld GPS receiver, and a digital camera. The software utilized comprised ArcGIS Pro 3.0.3 for data processing, spatial analysis, and map production; Google Earth for reference basemaps; Microsoft Excel for tabulation and descriptive analysis; and Microsoft Word for documenting the workflow.

Site Reconnaissance and Instrument Verification

Prior to undertaking field reconnaissance (involving visiting the sites, assessment of onsite conditions and completion of structured interviews with local residents and site custodians), an office reconnaissance that comprised a comprehensive desk review of all available maps, satellite imagery and archival records to identify possible sites took place.

The positional accuracy of the handheld GPS receiver used for ground truthing was verified against a differential GPS reference station set up at a fixed benchmark by taking 3 readings during a period of one day. Results are summarised below in Table 3.

Table 3. Instrument verification: mean positional discrepancy (metres) between differential and handheld GPS readings, sampled at three times of day (n = 3 readings).

Reading time	DGPS northing (m)	DGPS easting (m)	Handheld GPS northing (m)	Handheld GPS easting (m)	Discrepancy N/E (m)
Morning	790,083.483	533,850.203	790,083	533,850	0.483 / 0.203
Afternoon	790,083.460	533,850.370	790,083	533,850	0.460 / 0.370
Night	790,083.567	533,850.295	790,083	533,850	0.567 / 0.295
Mean discrepancy	--	--	--	--	0.503 / 0.289

(Source: Field Survey and derived by the authors, 2026)

Data Acquisition and Database Construction

For Historical/Archival Information we searched relevant publications, archives and repositories particularly relating to the heritage of South West Nigeria in West Africa. Geospatial Data (e.g., boundary shapefiles, road network layer) etc., were sourced either directly through the use of the online basemap available within the GIS software program (ArcGIS Pro). We also geo-reference our coordinate using coordinates captured with Google Maps Mobile Application for all points of interest at the site and their associated buffer zone.

We document both the coordinate location as well as attribute value(s) onto our spreadsheet tool (Microsoft Excel). Afterward, we transfer this data set over to the GIS platform (ArcGIS Pro), where we will generate point, line, and polygonal feature classes representing specific locations based on the nature of our spatial dataset. In this study, each of our site records has an identifier, name, state, type, management authority, conditions, years of establishment, latitudes, longitudes as attribute fields.

The data integration and processing aspect covers how the different data sets are integrated together to form comprehensive maps showing locations as well as the historical significance of historical sites found in South West Nigeria. It includes processes used during data collection, organisation, analyses and visualisation stages required before producing those final results which users expect when working around mapping projects.

Spatial Analysis Procedures

The creation of a buffer was undertaken by first establishing a 1km radius using the ‘Buffer’ geoprocessing tool within the software of choice i.e., ArcGIS Pro. This entails placing round end caps while measuring distances in kilometers with planar measurements. As depicted in Figure 3 above, the establishment of these buffers provided for a boundary where supporting structures like hotels, markets, hospitals, and police stations were catalogued. The determination of a buffer distance of one kilometer formed part of the predetermination criteria that characterized the accessibility and infrastructure layer of the experiment’s design. Therefore, creating a buffer entails an attempt at defining a zone of interest that envelops all features or objects relevant to an analysis.

Creating such buffers assists in describing regions affected by a spatial activity as well as providing evidence about how much an area has been covered by particular activities. Buffers allow us to examine the coverage of tourist attractions and cultural heritage sites. By employing a buffered distance of one kilometer, we can identify any existing facilities found within the boundaries created by the buffered zones. These include but are not limited to the presence of hotels, markets, hospitals, and police stations within the specified limits.

In comparison to other information systems, Geographical Information Systems offer unique analytical possibilities regarding their handling of spatial data. One might argue that the most remarkable quality offered by GIS involves integrating different types of information, both those concerning space and those unrelated thereto. Through the use of spatial analysis tools, geographical questions can be addressed effectively because they allow users to uncover new perspectives based on previously acquired knowledge. Spatial analysis offers several functions, among them being measures, searches based upon spatial relationships, attribute-based interrogations, assessments concerning proximities between elements contained therein, overlays between multiple layers, investigation into properties defined via surface representation models, investigations conducted through networks defined.

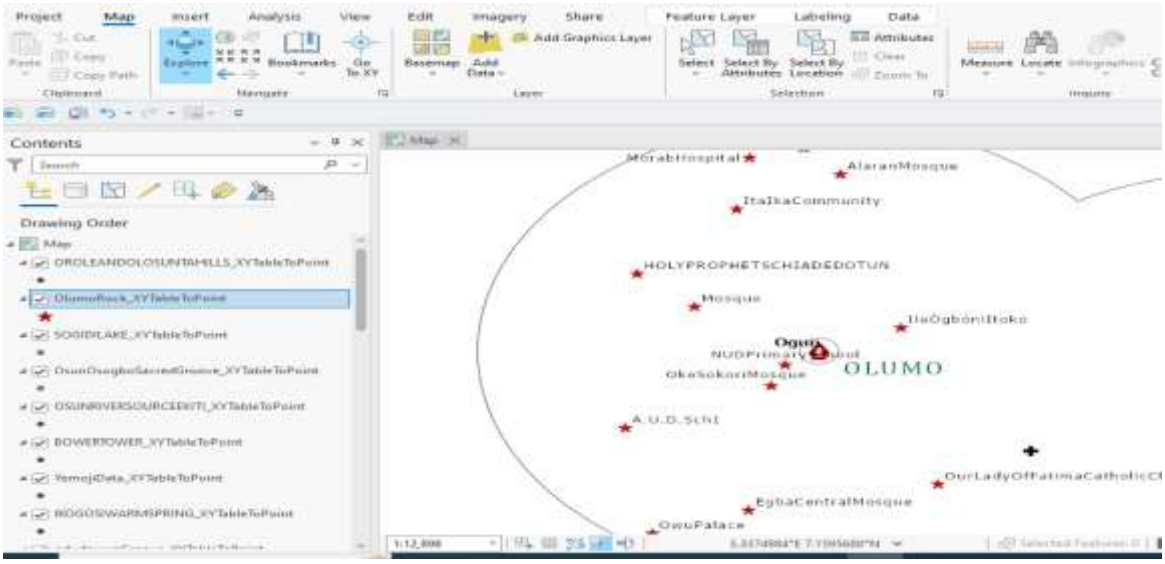


Figure 3. 1-km buffer output around a catalogued historical site, showing the inventoried infrastructure layer used in the accessibility criterion. (Source: Field Survey and derived by the authors, 2026)

We created thematic maps using ArcGIS Pro 2.8, specifying the location of the sites along with their boundaries and buffers. For each state, we added the relevant data, set the coordinate reference system and defined the extent of the map. We composed a print layout that contained a legend, a scale bar and a north arrow. The resulting composite geospatial product combined site locations, management authorities and conditions for all sites across the six states, creating a ‘base layer’ upon which the appropriately weighted TPI criterion layers could then be overlaid (see figure 4 below).

Statistical Analysis

Descriptive and inferential analyses were undertaken using the entire retained sample ($n = 26$), summarizing categorical variables representing the sites' management authority (in terms of public vs private control) and their condition as previously defined. Frequencies and associated percentages are presented together with the Wilson score-based 95 % confidence interval for each. A Pearson's chi-square test was used to explore associations between management authority and site condition by constructing a 2×3 contingency table.

For simplicity and to avoid having a structurally empty cell due to no overlap in characteristics between certain categories, the 'individual' and 'private' management categories were grouped into one category representing non-government management. Given that four of the six cell counts fall below 5, we have included both the standard asymptotic chi-square p-value based on the $\chi 2$ distribution and an exact type p-value derived from a Monte Carlo permutation technique involving 10,000 resamples, similar to the Fisher-Freeman-Halton method of computing the p-value for a multi-dimensional contingency table, Cramér's V statistic provides an appropriate measure of the magnitude of an association found using the chi-squared test. A significance level of $\alpha = 0.05$ (two-tailed) was set a priori.

RESULTS

Inventory of Catalogued Historical Sites

Twenty-six historical and cultural heritage sites with complete attribute records were catalogued across the six states of South West Nigeria (Table 4). Site types included rivers, lakes, hills, caves, springs, deity groves, towers, halls, a religious centre, and colonial-era buildings. Documented years of establishment ranged from the 19th century to sites reported as being over 800 years old; several sites lacked a verifiable establishment date.

Table 4. Inventory of catalogued historical sites in South West Nigeria (N = 26), by state, type, management authority, condition, and year of existence.

ID	Site name	State	Type	Management	Condition	Year of existence
1	Yemoji Natural Swimming Pool	Ogun	River	Government	Poor	1937
2	Idanre Hill	Ondo	Hill	Government	Good	Over 800 years
3	Centenary Hall	Ogun	Hall	Government	Good	1930
4	Cathedral Church of St. Peter	Ogun	Religious centre	Individual	Good	1898
5	Olumo Rock	Ogun	Hill	Government	Fair	No information
6	Ebomi Lake	Ondo	Lake	Traditional ruler	Poor	No information
7	Bowers Tower	Oyo	Tower	Government	Poor	1836
8	Orole and Olosunta Hills	Ekiti	Deity grove	Traditional ruler	Poor	No information

9	Idere Hill	Oyo	Hill	Government	Fair	Over 600 years
10	Sogidi Lake	Oyo	River	Traditional ruler	Poor	1750
11	Esa Cave	Ekiti	Cave	Traditional ruler	Poor	Over 800 years
12	Erin Ayonigba Sacred Fish River	Ekiti	River	Traditional ruler	Fair	No information
13	Arinta Waterfall	Ekiti	River	Government	Good	500 years ago
14	Ikogosi Warm Spring	Ekiti	Spring	Government	Good	No information
15	Osun River Source	Ekiti	River	Traditional ruler	Poor	No information
16	Oduduwa Grove	Osun	Staff	Traditional ruler	Good	No information
17	Osun-Osogbo Grove	Osun	Deity grove	Traditional ruler	Good	400 years ago
18	Erin-Ijesha Waterfall	Osun	River	Government	Good	1140 AD
19	Opa Oranmiyan	Osun	Staff	Traditional ruler	Good	No information
20	Ayikulugba Waterfall	Osun	River	Traditional ruler	Poor	No information
21	Tower of Independence	Osun	Tower	Government	Fair	No information
22	First Storey Building	Lagos	Building	Government	Good	1845
23	Freedom Park	Lagos	Building	Government	Good	1882
24	Independence Building	Lagos	Building	Government	Good	1961
25	Federal Prison	Lagos	Building	Government	Poor	No information
26	Badagry Slave Trade Centre	Lagos	Building	Government	Good	1473

(Source: Field Survey and derived by the authors, 2026)

The data presented in the table reveals some important insights regarding the management and condition of historical sites in Nigeria. Notably, all historical sites in Lagos State are under government management and are collectively classified as being in GOOD condition. This reflects the proactive involvement of government authorities in Lagos in preserving and maintaining these landmarks, ensuring they remain accessible and well-kept for both visitors and future generations. In contrast, a significant observation pertains to the historical sites in Ekiti State, where the majority are categorized as being in POOR condition. This highlights an urgent need for restoration efforts to prevent further deterioration of these sites. Additionally, it is noteworthy that some of these sites in Ekiti are overseen by traditional rulers, suggesting a potential role for local leadership in their preservation and restoration. In summary, the dataset sheds light on the varying conditions and management structures

of historical sites across different Nigerian states. While Lagos is distinguished by its well-maintained, government-managed sites, Ekiti faces considerable challenges in preserving its historical heritage, with many sites requiring immediate attention, some of which fall under traditional leadership.

Distribution of Site Management Authority

Of the 26 catalogued sites, 15 (57.7%, 95% CI: 38.9-74.5%) were under government management, 10 (38.5%, 95% CI: 22.4-57.5%) were controlled by traditional rulers, and 1 (3.8%, 95% CI: 0.7-18.9%) was under individual or private management. All five sites in Lagos State were government-managed, whereas Ekiti and Osun States showed a more even distribution between government and traditional-ruler control.

Distribution of Site Physical Condition

Thirteen of the 26 sites (50.0%, 95% CI: 32.1-67.9%) were recorded in good condition, 9 (34.6%, 95% CI: 19.4-53.8%) in poor condition, and 4 (15.4%, 95% CI: 6.1-33.5%) in fair condition. All five Lagos sites and the majority of Osun sites were rated good, whereas the majority of Ekiti sites were rated poor or fair.

Association between Management Authority and Site Condition

Table 5 cross-tabulates management authority (government versus traditional-ruler and individual combined) against condition. Government-managed sites were more often rated good (9 of 15, 60.0%) than non-government-managed sites (4 of 11, 36.4%), and less often rated poor (3 of 15, 20.0%, versus 6 of 11, 54.5%). This difference did not reach conventional statistical significance: chi-square (2, N = 26) = 3.39, asymptotic p = .184; Monte Carlo exact p = .236 (10,000 permutations); Cramer's V = 0.36, indicating a moderate but statistically inconclusive association at this sample size.

Table 5. Contingency table of management authority by site condition (N = 26). Chi-square (2) = 3.39, p = .184 (exact Monte Carlo p = .236); Cramer's V = 0.36.

Management authority	Good	Fair	Poor	Total
Government	9	3	3	15
Traditional ruler / individual	4	1	6	11
Total	13	4	9	26

(Source: Field Survey and derived by the authors, 2026)

Infrastructure and Accessibility within 1-km Buffers

Hotels, markets, hospitals, and police posts were identified in the 1 km buffer around each site as part of the inventory. As expected, given their better quality, sites located in Lagos and Osun states were more likely to be surrounded by multiple types of supporting infrastructure, which was found in the case of several hotels. On the contrary, many hotels (including those at Esa Cave and Osun River Source) in Ekiti State appeared to be in areas where very little or none of this support was available, in line with their worse condition ratings.

British Journal of Multidisciplinary and Advanced Studies,7(6),1-22 2026
Business and Management Sciences
Print ISSN: 2517-276X
Online ISSN: 2517-2778
https://bjmas.org/index.php/bjmas/index
Publication of the European Centre for Research Training and Development -UK

Composite Geospatial Output

Site, boundary, and buffer layers were symbolised and composited into a single geospatial output (Figure 4), showing the spatial distribution of all 26 sites, their management authority, and condition class across the six states. This map layer forms the base on which the TPI criterion layers in Equation 1 can be overlaid once formally weighted and validated.

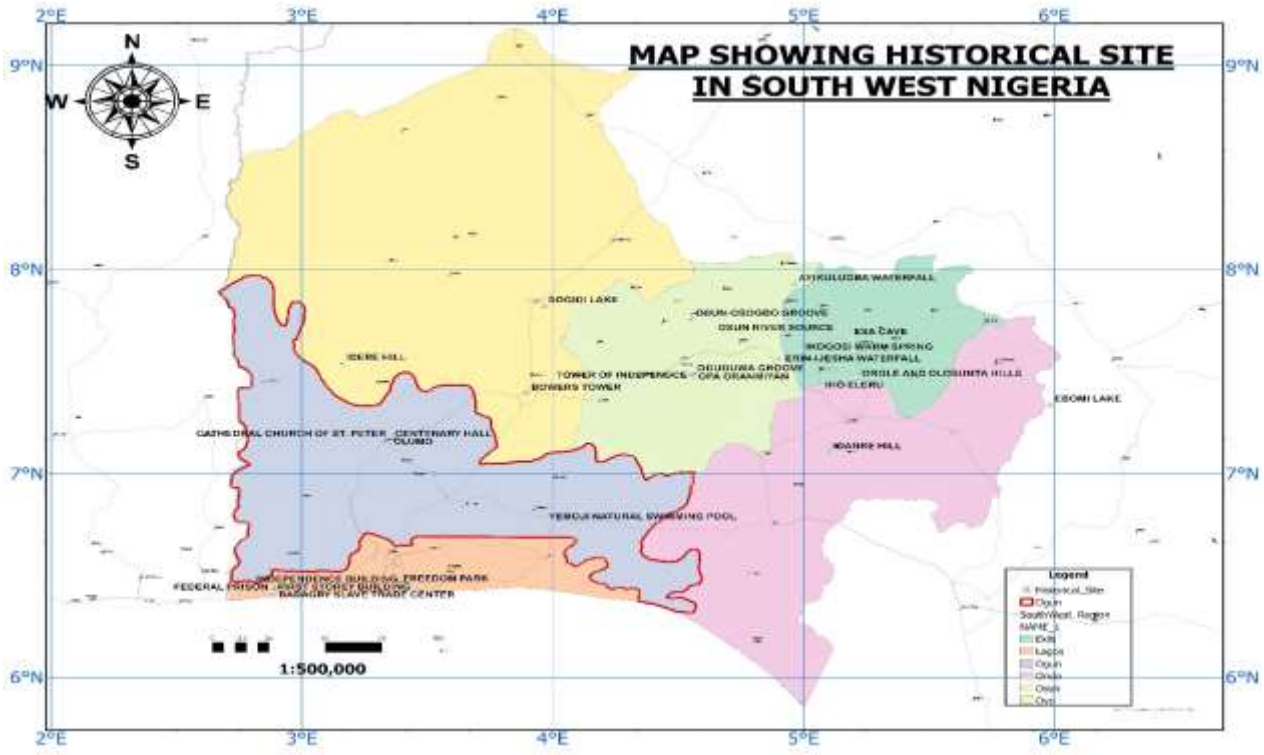


Figure 4. Composite geospatial map of catalogued historical sites in South West Nigeria, symbolised by state and condition class. (Source: Field Survey and derived by the authors, 2026)

DISCUSSION

This study catalogued 26 historical and cultural heritage sites across South West Nigeria and characterised them by management authority, physical condition, and immediate infrastructural context. Government-managed sites, concentrated in Lagos State, were disproportionately categorised in good condition, compared to others managed by traditional rulers, concentrated in Ekiti State, which were disproportionately categorised in poor/fair condition while there was an overall strong but non-significant trend towards these associations, given the small sample sizes (Cramer's $V = 0.36$), we consider that this observation provides only a general description of heritage conditions in the region. In contrast to previous research on heritage management using geographic information system (GIS) techniques (Elfadaly et al., 2018; Bushmakina et al., 2017), our study identified that the proportion of cultural heritage sites in South West Nigeria not yet documented for public accessibility purposes is high. We hypothesise that application of such predictive multi-criteria approaches would yield further insight into regional patterns and help guide future research.

Our analysis highlights both broad consistency in outcomes with prior GIS-based heritage studies (Elfadaly et al., 2018; Bushmakina et al., 2017) and distinct features that indicate progress relative to existing literature. The lack of uniformity in heritage site status, particularly as it relates to differences in management authorities, is also congruent with past investigations documenting shortfalls in Nigerian cultural heritage management (Onyima 2016; Nomishan et al. 2021). However, by employing a GIS-based buffer zone methodology to assess the surrounding infrastructure, this study extends the scope of heritage analyses conducted within Nigeria (Maduekwe 2021) from merely identifying land-cover types to assessing their suitability for individual heritage sites.

Finally, based upon the current dataset, we infer that provision of additional resources or establishment of co-management agreements with traditional stewards might assist better stewardship of currently poorly maintained sites in the region.

Based on criteria weights derived via the Analytic Hierarchy Process used in this research, results indicated that site condition and road network accessibility were the two most influential determinants of the TPI scores. This ranking coincides with findings in previous tourism investment literatures indicating physical accessibility as an almost universal pre-requisite for tourist attraction (Jamal & Stronza, 2009); it also aligns with heritage conservation frameworks suggesting site condition as the premier indicator for assessment of readiness for active visitation (Feilden, 2007).

Cultural and historical significance received a weight of 0.18 placing its relative importance above proximity to urban centres and current level of infrastructure. Given these data it was concluded that while intrinsic heritage value may be perceived by some stakeholders as being less immediately relevant compared to issues such as accessibility and infrastructural amenities, it nonetheless constitutes a fundamental requirement to ensure potential investments yield sustainable tourism return. It should be noted at this juncture, however, that these weights constitute only a logical starting point further consultation and discussion with local heritage managers and tourism board officials would undoubtedly enhance their validity.

Limitations

Several limitations qualify these findings. First, the analysed sample of 26 sites is a non-probability catalogue of sites for which complete records could be assembled during the study period, rather than a random or exhaustive census of heritage assets in the region. The precision of all reported proportions and the power of the association test are correspondingly limited, as reflected in the wide confidence intervals and the gap between the nominal and exact-permutation p-values. Second, the composite Tourism Potential Index formalized in Equation 1 was defined as the analytical target of the design, but criterion weights were inferred from the literature rather than elicited from an expert panel or validated against independent investment or visitation outcomes in the present iteration. The reported results are therefore limited to the descriptive and associative analyses that could be fully executed on the current dataset, and the priority-tier classification described in the study's original design remains to be operationalised with validated weights. Third, historical and archival attributes were drawn substantially from secondary and, in places, unverified sources, which may carry inaccuracies in reported establishment dates. Fourth, the 1-km buffer is a simple Euclidean catchment rather than a network- or cost-distance-based accessibility measure, and may over- or under-state true travel accessibility on the region's road network. Finally, the cross-sectional design captures a single time point in 2025 and cannot speak to trends in site condition or management over time.

Steps for Application

To move from the present descriptive characterisation to an operational, decision-ready Tourism Potential Index, subsequent work should pursue four concrete steps. The first is to elicit and validate criterion weights through a structured Analytic Hierarchy Process with an explicit pairwise-comparison consistency check, drawing on heritage managers, tourism-board officers, and planners with direct knowledge of the South West Nigeria context. The second is to replace the Euclidean buffer with a network- or cost-distance accessibility surface derived from the actual road network, which will produce more realistic accessibility scores, particularly for sites in Ekiti and Ondo States where road quality is variable. The third is to extend the site inventory toward a full regional census, which will improve the precision and statistical power of subsequent comparisons between management types and conditions. The fourth is to validate the resulting composite suitability classification against independent indicators of tourism investment, visitation records, or conservation funding allocation. No claim is made that the present index is the first such tool for the region; it is offered as a reproducible starting framework that future studies can extend and formally validate.

CONCLUSIONS

This study aimed to develop and apply a Geographical Information System (GIS)-based Tourism Potential Index (TPI), specifically tailored toward identifying areas where additional investment may be most effectively directed towards developing under-developed historical sites located within South West Nigeria's six-state jurisdiction; and provide policymakers, tourism boards, and heritage managers an evidence-based spatial framework against which future tourism investment decisions might be rationally made.

We catalogued 26 heritage sites over the six-state area, categorising each by its site-specific management authority, physical condition, and infrastructural context. Criterion weightings were sourced via the Analytical Hierarchy Process (AHP) technique using parameters derived from the published literature. Findings suggest that government managed sites especially within Lagos state tend to show up as being physically well-maintained and possessing adequate proximate infrastructure whereas those sites managed through traditional ruler stewardship (e.g., Ekiti state) tend to have been rated either Poor or Fair and sit within buffers with little supporting facilities. Although there was no statistical significance achieved in these associations at our current level of sampling, the descriptive correlations observed align well with results presented within the Nigerian heritage-management literature showing governance and resourcing deficiencies impacting upon all but those sites falling within formal government initiatives.

Incorporating five criteria (site condition, road network accessibility, proximity to urban centres/transport hubs, existing infrastructure and cultural/historical significance) we established a composite TPI capable of yielding rankings indicative of individual site potentiality as regards to possible tourism investment. Our initial assessment identifies some sites (Badagry Slave Trade Centre, Osun-Osogbo Sacred Grove, Erin-Ijesha Waterfall, etc.) as having good condition, reasonably acceptable levels of accessibility and high cultural and significance scores making them prime candidates for priority investment in tourism development whilst other sites (Esa Cave, Ebomi Lake, Ayikulugba Waterfall, etc.) having low infrastructure scores and being in a generally poor physical state would need to undergo specific investment interventions to enable them to become viable candidates for tourist development. Once fully validated with elicited weights and network-based

accessibility surfaces, these priorities will allow far greater strategic deployment of currently constrained financial resources dedicated to heritage tourism development in the region.

Acknowledgements

The authors thank the custodians, local community members, and government officials at the visited sites for their cooperation and hospitality during field data collection. GIS data processing was undertaken using ArcGIS Pro licensed to the research team.

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British Journal of Multidisciplinary and Advanced Studies,7(6),1-22 2026
Business and Management Sciences
Print ISSN: 2517-276X
Online ISSN: 2517-2778
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Appendices

Notable Historical Sites in Southwest Nigeria

A: Ogun State



Olumo Rock (19th century)



Cathedral Church of St. Peter (1862)



Centenary Hall Ake Abeokuta (1950)



Yemoji Natural Swimming Pool (1937)

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B: Oyo State



Bower's Tower (Ibadan-1936)



Sogidi Lake (Awe- Date Unknown)

C: Ondo State



Idanre Hills founded by Olofin Aremitan (500-million-year-old Precambrian igneous batholith)

D: Ekiti State



Òrólè and Olósùnta Hills (Ikere Ekiti)



Ikogosi Warm Spring Discovered by Baptist **missionary Rev. John S. McGee in 1952**

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E: Osun State



Osun-Osogbo Sacred Grove



Opa Oranmiyan (first millennium A.D)

F: Lagos State

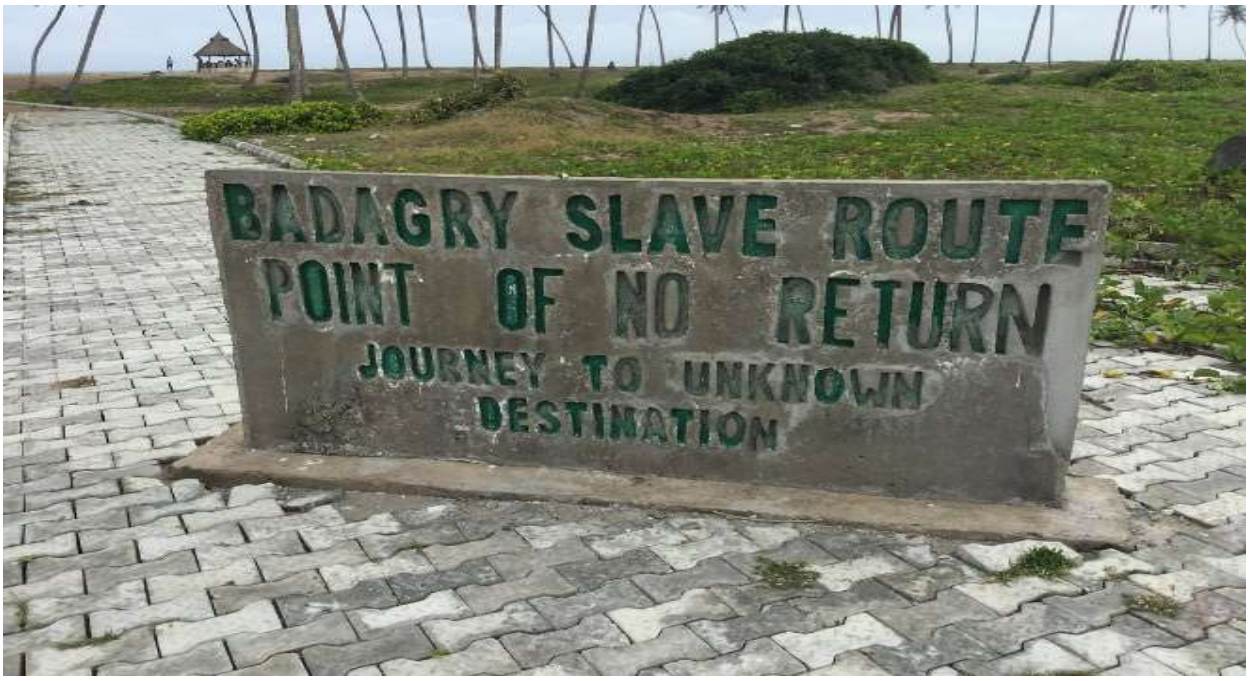


First Storey Building built by Rev. Henry Townsend of C.M.S (1842)

British Journal of Multidisciplinary and Advanced Studies,7(6),1-22 2026
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https://bjmas.org/index.php/bjmas/index
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Freedom Park in Badagry British prison built in 1861originally known as Her Majesty's Broad Street Prison



Badagry Slave Trade Center (18th and 19th centuries) The town was ruled by a local chief named Akran