



# Drivers of Biodiversity Conservation in Sacred Groves: A Comparative Study of Three Sacred Groves in Southwest Nigeria

RESEARCH ARTICLE

SAMUEL OLUWANISOLA ADEYANJU

JANETTE BULKAN

JONATHAN C. ONYEKWELU

GUILLAUME PETERSON ST-LAURENT

ROBERT KOZAK

TERRY SUNDERLAND

BERND STIMM

\*Author affiliations can be found in the back matter of this article

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## ABSTRACT

Globally, sacred groves represent a traditional form of community-based conservation, recognized as areas of cultural and religious importance to local people. In some cases, the entire community guards against the desecration of, or unauthorized access to, such sites, either by its members or outsiders; in others, non-recognition of customary rights is linked to degradation. This paper uses the case study of three sacred groves in southwest Nigeria to examine the extent to which perceived socio-economic and religio-cultural benefits contribute to biodiversity conservation in sacred groves with different scales of governance. Using mixed methods approaches, we found that the long-term preservation of sacred groves and their biodiversity depend on collaboration between: i.) customary institutions (community-based conservation through a system of established traditional norms and prohibitions), and ii.) formal government legislation and management. The recognition of sacred groves as national monuments and UNESCO World Heritage Site has paved the way for biodiversity protection, increasing cultural tourism, socio-economic rewards and the preservation of religio-cultural values. We present local peoples' assessments of the benefits of sacred groves and offer suggestions to improve community engagement and protect the biodiversity within sacred groves in Nigeria.

## CORRESPONDING AUTHOR:

**Samuel Oluwanisola Adeyanju**  
University of British Columbia, CA  
[samuoloadeyanju@gmail.com](mailto:samuoloadeyanju@gmail.com)

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## 1. INTRODUCTION

“Sacred natural sites” is a term used to refer to land or bodies of water that have special spiritual significance to peoples and communities (Verschuuren et al., 2010). Sacred natural sites (hereafter “sacred groves”) can include individual trees, forests, rivers, waterfalls, meadows, wildlife, caves, lakes, and hills (Bhagwat and Rutte, 2006; Liljebld and Verschuuren, 2019; Ormsby, 2012a). Sacred groves that hold strong cultural and religious importance to local people are increasingly recognized as a traditional form of community-based conservation (Bulkan, 2017; Ormsby and Bhagwat, 2010).

In many countries, sacred groves exhibit characteristics that qualify them as “spiritual/sacred commons” (Rutte, 2011; Samakov and Berkes, 2017). In general, only a few studies have applied Ostrom’s principles for common pool resources management to sacred grove systems (Marini Govigli et al. 2021; Ostrom, 1990; Rutte, 2011; Samakov and Berkes, 2017). Sacred groves have been shown to exhibit most of the design principles that Ostrom found in well-governed common-pool resource systems (Rutte, 2011). However, Samakov and Berkes (2017) have referred to sacred groves as “commons with a difference” because they sometimes lack the elements of “excludability and subtractability”.<sup>1</sup> As commons, sacred groves are often shared resources managed by local communities through rules, prohibitions, and punishment of unauthorized access (Marini Govigli et al., 2021; Samakov and Berkes, 2017). The operation and management of these sacred groves are closely linked to enduring religious beliefs and complex socio-cultural associations with deities (Aniah and Yelfaanibe, 2016; Mgumia and Oba, 2003). Unlike conventional commons, sacred commons may have multiple values that may not be apparent to outsiders (Samakov and Berkes, 2017).

Although sacred groves were not created primarily for biodiversity conservation (Sheridan, 2009), they are often the only remaining patches of natural or semi-natural habitats in several landscapes (Dudley et al., 2010). In some cases, sacred groves have been heavily modified, degraded and deforested, making them ecologically unsustainable (Dudley et al., 2010). Nonetheless, the aggregate contributions of sacred groves to biodiversity conservation, ecosystem resilience, and protection against intense land-use pressure are widely recognized (Bhagwat and Rutte, 2006; Rutte, 2011). The rich biodiversity found in sacred groves sometimes exceeds nearby protected areas and State-managed forest reserves (Onyekwelu and Olusola, 2014).

Sacred groves are found in many countries globally and are especially common in parts of Asia and Africa (Verschuuren et al., 2010). They are found throughout

tropical Africa and are traditionally associated with deity worship, initiation rituals, and sacrifices (Ceperley et al., 2010; Sheridan, 2009). The ecological status of African sacred groves is often dependent on economic, political and legal processes (Sheridan, 2009). Globally and in Nigeria, there are illegal exploitation of the resources in sacred groves for personal economic benefit (Bhagwat and Rutte, 2006; Dudley et al., 2010; Probst, 2009). In political and legal terms, while many African countries have long-standing legal procedures to guarantee the status of sacred groves and to regulate cultural activities, these are often only paper procedures, not applied or monitored (Sheridan, 2009).

In southwest Nigeria, sacred groves are historically associated with the Yoruba people, for whom they are a symbol of religio-cultural identity (National Commission for Museums and Monuments (NCMM), 2005). There is no estimate of the number of sacred groves in Nigeria. Previous studies in Nigeria have focused on Osun Osogbo Sacred Grove, a UNESCO World Heritage Site in southwest Nigeria, while little attention has been paid to lesser-known sacred sites (Osegale et al., 2014; Oyeleke et al., 2017; Probst, 2013).

In this study, we address these knowledge gaps by comparing three sacred groves located in two states in southwest Nigeria: Osun Osogbo, a National Monument site (Idanre Hills), and a local cultural site (Igbo-Olodumare). Our central research question examines the extent to which perceived socio-economic and religio-cultural benefits contribute to biodiversity conservation in these sacred groves. We also highlight the influence of different scales of governance (formal and informal) on biodiversity conservation.

## 2. SACRED GROVES AS MULTIFUNCTIONAL LANDSCAPES

Indigenous peoples’ territories, covering about 40 million km<sup>2</sup> of land in 87 countries, overlap with significant concentrations of the world’s remaining biodiversity (Garnett et al., 2018). Besides a site for practicing their faiths and upholding traditional customs, local people derive multiple benefits from sacred groves (Daniel et al., 2016; Rutte, 2011). In Africa, sacred groves in Tanzania have greater woody species richness and taxonomic diversity than the State-managed forest reserves, despite their relatively small size (Mgumia and Oba, 2003). In Ghana, sacred groves provide sanctuary for rare, threatened or endangered (RTE) species and in the central region of the Republic of Benin, the diversity of tree species in sacred forests is higher than in rural residential areas (Aniah and Yelfaanibe, 2016; Ceperley et al., 2010). In southwest

Nigeria, one study showed that Osun Osogbo had the highest species richness and harboured a higher count of endangered species compared to both primary and degraded forests (Onyekwelu and Olusola, 2014).

Sacred groves provide tangible and intangible benefits, explaining their continuing survival (Rutte, 2011). First, sacred groves are an essential part of local communities' cultural and traditional beliefs and activities (Adesiji and Babalola, 2012), anchoring place-based connections built over generations (Liljeblad and Verschuuren, 2019). In Nigeria, sacred groves are the sites for rituals, initiations, festivals, and ceremonies, including selecting and installing kings (Daniel et al., 2016). They accommodate secrecy and privacy, which characterize the worship of deities in many traditional communities (Probst, 2013). Some places serve as burial sites for children and 'wicked people' (i.e., those who died mysterious deaths) (Bhagwat and Rutte, 2006). Some Nigerian sacred forests have shrines that receive visitors who seek supernatural solutions to their predicaments, such as strange illnesses, poverty, joblessness, and fertility issues (Yusuf, 2016). Furthermore, sacred groves are also good sources of a variety of Non-Timber Forest Products (NTFPs) and medicinal plants (Dudley et al., 2010; Lebbie and Guries, 1995).

Second, sacred groves may provide economic benefits to governments while, at the same time, contributing to food security for households (Oyelowo et al., 2014; Udeagha et al., 2013). Developing sacred groves into tourist destinations like Osun Osogbo attracts more visitors and generates income (Osegale et al., 2014; Probst, 2013, 2016).

### 3. METHODOLOGY

#### 3.1. STUDY SITES

The selection of the three sacred groves in this paper was based on three criteria: (1) unique features of each grove (ecology and spectrum of governance), (2) willingness of management to grant access for research, and (3) availability of previous studies on the biodiversity conservation status of each grove (Onyekwelu and Olusola, 2014, see Figure 1).

##### Idanre Hills

Idanre Hills (locally called *Oke-Idanre*) is an ancient natural landscape inhabited for almost 1,000 years (NCMM, 2007). Located in the town of Idanre in Ondo State, the grove is now reduced to isolated hills with steep sides and rounded tops, at about 914.4 metres above sea level.

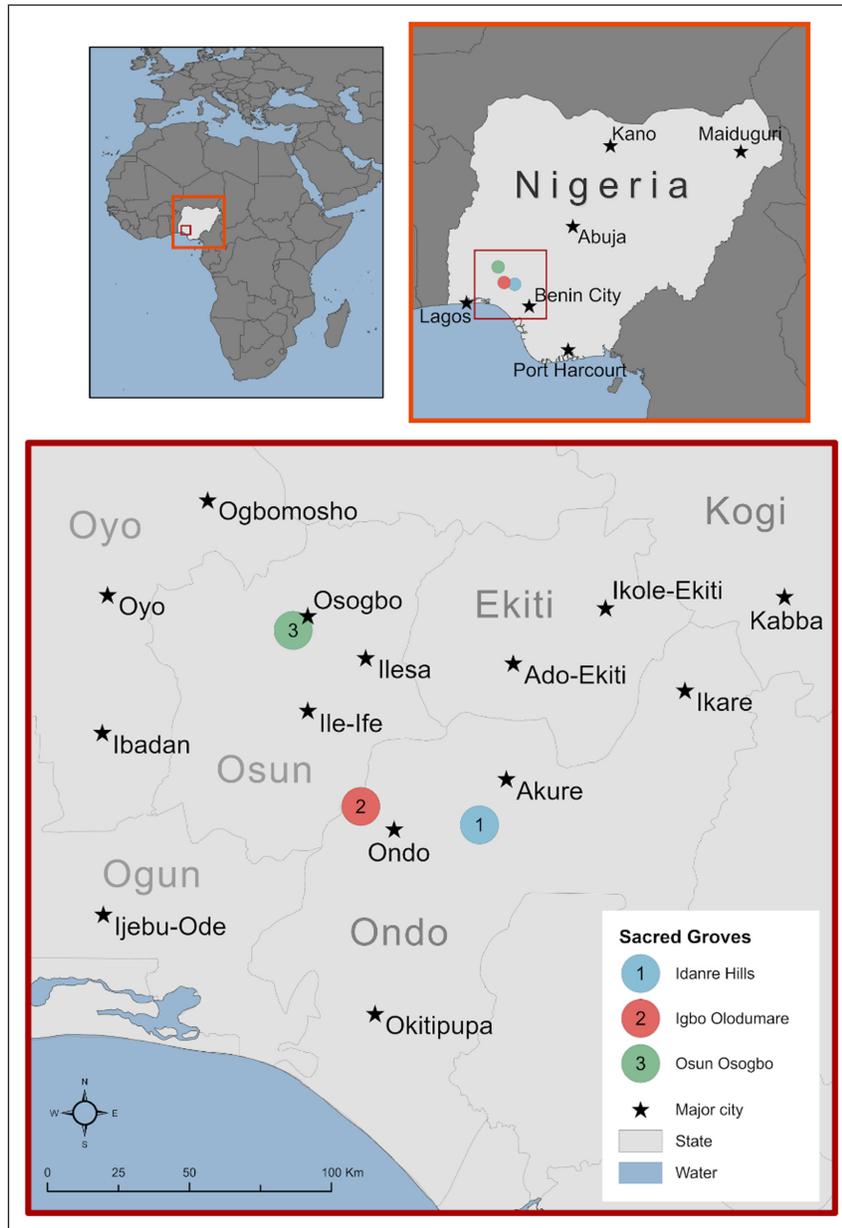
Idanre Hills was declared a National Monument in 2014 (Akinde, 2018) and was nominated as a UNESCO World Heritage Site in 2007 by the Nigerian government

through the NCMM. The grove remains on the tentative list of UNESCO World Heritage Sites. The nominated property (Oke-Idanre Cultural Landscape) for the UNESCO designation covers an area of 637.7 hectares, with a buffer zone estimated at 2,052 hectares (Akinde, 2018). The grove staff are employed by the Ondo State government under the Ministry of Culture and Tourism, with the involvement of local leaders (king and chiefs), cultural groups, and the NCMM (Adigun et al., 2016; Oladeji and Akinrinola, 2010).

The forested areas in the grove harbour diverse tree and wildlife species, including 174 insect, 4 fish, and 13 mammal species, including monkeys (*Cercopithecus sp.*), bats (*Rousettus aegyptiacus*) and hyrax (*Dendrohyrax dorsalis*) (Bai et al., 2018; NCMM, 2007). The people of Idanre formerly lived and farmed on the hills before moving downhill in 1923. On the hilltop, certain historical features remain, including the ancient palace of Owa (the traditional title of the king of Idanre), burial sites for Idanre kings, and caves (NCMM, 2007; Oladeji and Akinrinola, 2010). Farming still takes place in some parts but not in the sacred sections reserved for traditional chiefs and priests to worship Olofin and Orosun deities (NCMM, 2007). These restricted sections, such as burial sites and old houses, are used for indoor ritual sessions and prayers. Several traditional festivals are held at specific times during the year, including Orosun, Ije, Usé (bat) and Ogun Festivals (Adebayo, 2017; NCMM, 2007). Idanre is the only site in Yorubaland where the Usé (bat) Festival has been celebrated biannually over the years (Akinde, 2018).

##### Igbo-Olodumare

Igbo-Olodumare (translated "The Forest of the Almighty") is a lush rainforest on rocky hills covering an area of 7 hectares in Oke-Igbo in Ondo State. Igbo-Olodumare became more widely known after 1949 through the writings of D.O. Fagunwa, a Nigerian Yoruba author who pioneered the Yoruba-language novel, and who described the grove as a forest of "witches, wizards, giant snails, crabs and other mysterious things" (Kolawole, n.d.). Although no sacrifices are made within the forest, trees and statues remain objects of worship and inspiration to visitors (Oyelowo et al., 2014). The Ministry of Culture and Tourism is responsible for the protection and management of Igbo-Olodumare and employs a community member who is in charge of the grove. Tourists are admitted only in certain sections of the grove and resource extraction and encroachment are prohibited. However, over the years, the land around Igbo-Olodumare has been converted into an agricultural settlement. The majority of the inhabitants are seasonal migrants in cocoa and palm oil plantations<sup>2</sup> and have no ancestral links to the grove.



**Figure 1** Map of Nigeria showing the study sites. The map was created by Agatha Czekaljo.

### Osun Osogbo Sacred Grove (OOSG)

Osun Osogbo Sacred Grove (hereafter “OOSG”) is located along the banks of the Osun River in the town of Osogbo in Osun State. Founded some 400 years ago, it is the largest sacred grove remaining in Yorubaland (NCMM, 2005). In 2005, OOSG was declared a UNESCO World Heritage Site (Probst, 2009), and is managed by the National Commission for Museums and Monuments (NCMM), a Federal Government Agency (Ogundiran, 2014). Federal Decree 77 of 1979, which conferred legal protected status on OOSG (NCMM, 2005), prohibits tree cutting, hunting, fishing, burning, encroachment for farming or building houses, and dumping of refuse (Probst, 2013).

OOSG has a forest area of 75 hectares, bounded by a 47-hectare buffer zone (Onyekwelu and Olusola, 2014). OOSG harbours over 400 species of plants and provides habitat for wildlife, including the endangered white-throated guenon (*Cercopithecus erythrogaster*), vulnerable putty-nosed monkey (*C. nictitans*) and the threatened red-capped mangabey (*Cercocebus spp.*) (NCMM, 2014; Osegale et al., 2014; Yusuf, 2016).

The forest sanctuary also contains forty shrines, two ancient palaces, and many sculptures and other works of art in honour of Osun and other deities (Osegale et al., 2014). Osun, the river goddess, is worshipped by many for her powers and interventions on behalf of supplicants.

While most parts of the grove are accessible to visitors and tourists, some sections are restricted to Osun priestesses, Osun adherents and the Ogboni Cult—an elitist society of men of great political and economic influence and affluence (Osegale et al., 2014).

### 3.2. QUESTIONNAIRE DEVELOPMENT

Based on our assessment of over 20 peer-reviewed articles on sacred groves and biodiversity conservation in Nigeria, Africa, and the world, we identified various benefits provided by sacred groves to local peoples. We then selected the 16 most commonly cited benefits relating to biodiversity conservation and grouped them into two categories: socio-economic and religio-cultural benefits (Table 1). We asked the respondents to rank their level of agreement concerning the 16 presumed benefits driving conservation in sacred groves. A 4-point Likert scale was used, ranging from “strongly disagree (1)” to “strongly agree (4)” with an “I don’t know” option included.

### 3.3. DATA COLLECTION

We used a mixed-methods approach, combining semi-structured survey questionnaires, interviews, focus group discussions, and document analyses, to maximize the strengths of both quantitative and qualitative research methodologies (Bryman, 2012). Field data were collected in February and March 2019. We surveyed eight proximate communities to get a representative sample of 167 informants (Table 2). Our respondent group consisted of sacred grove priests, deity worshippers, artisans, farmers, traders, and students (Table 3).

We used both random and purposive sampling methods to select questionnaire respondents to ensure that we captured the views of a representative sample of community members. Some respondents filled out the questionnaire themselves; others dictated their answers to the research team. The questionnaires were in English, but the research team translated the questions into Yoruba (the local language). In addition, we were granted two one-hour semi-structured interviews with the Head of the Education Unit of OOSG and the officer in charge of the Igbo-Olodumare Grove. We also conducted seven hour-long focus groups sessions across the groves in which we further explored insights from the surveys and interviews (Marshall and Rossman, 2016). Each focus group involved four to nine participants (male and female). Every participant provided consent, either verbally or in written form. This study received the full approval of the University of British Columbia’s Behavioural Research Ethics Board (Certificate number H19-00297) and the consent of local authorities.

### 3.4. DATA ANALYSIS

We performed statistical data analysis using R Studio (version 3.6.0) and employed descriptive statistics (e.g., means and proportions) to summarize our results. Data from Likert scales, for which we combined the score of each Likert item into a composite scale, was assumed to be interval in nature and thus analyzed using parametric statistics. In contrast, if used individually, data from individual Likert items (i.e., no attempt to combine individual responses into composite scales) was assumed to be ordinal and analyzed using non-parametric statistics

CATEGORIES	LIST OF DRIVERS
Socio-economic drivers	Income generation, provision of social amenities, timber for poles and buildings, Non-Timber Forest Products (NTFPs) collection, fishing, hunting, tourism potential, employment opportunities
Religio-cultural drivers	Place of worship, ritual site, meeting point for traditional ceremonies, ordination of kings, place to seek supernatural interventions, cultural promotion, shelter for deities

**Table 1** List of possible benefits driving biodiversity conservation in sacred groves.

	OSUN OSOGBO SACRED GROVE	IDANRE HILLS	IGBO-OLODUMARE
State	Osun State	Ondo State	Ondo State
Status	UNESCO World Heritage Site	Nigerian National Monument	State/Local cultural heritage site
# of survey respondents	64 (6 priests; 58 community members)	63 (2 priests; 61 community members)	40 <sup>3</sup> (1 priest; 39 community members)
# of focus groups	2	3	2
# of interviews with key informants	1	Nil	1

**Table 2** Number and category of participants who took part in the study.

VARIABLE	TOTAL NUMBER	PERCENTAGE (%)
Gender		
Female	63	38
Male	104	62
Age range (years)		
18–35	30	18
36–60	75	45
≥ 61	62	37
<b>Education Level</b>		
Informal education	51	31
Primary	29	17
Secondary	65	39
Tertiary	22	13
<b>Occupation</b>		
Agric. Rel. Jobs	56	33
Government workers	6	4
Others	95	57
Unemployed	10	6
Monthly Income (Naira – #) <sup>4</sup>		
10,000–40,000	77	46
41,000–70,000	45	27
71,000 – 100,000	5	3
≥ 100,000	16	10
Prefer not to answer	24	14
Religion		
Christianity	76	46
Islam	48	28
Traditional	43	26
Nativity		
Natives	121	72
Migrants <sup>5</sup>	46	28

**Table 3** Overview of survey respondents' demographics across the three sacred groves.

(Clason and Dormody, 1994; Peterson St-Laurent et al., 2018). We carried out one-way analysis of variance (ANOVA) with post hoc test Tukey Honest Significant Differences (HSD) to compare the level of agreement to the categories of benefits (i.e., the aggregated score of the eight Likert items for socio-economic and religio-cultural) driving biodiversity conservation within and between the

sacred groves. We transcribed and manually coded the qualitative data from key informant interviews and focus groups. We included quotations from the qualitative data to support the quantitative data.

## 4. RESULTS AND DISCUSSION

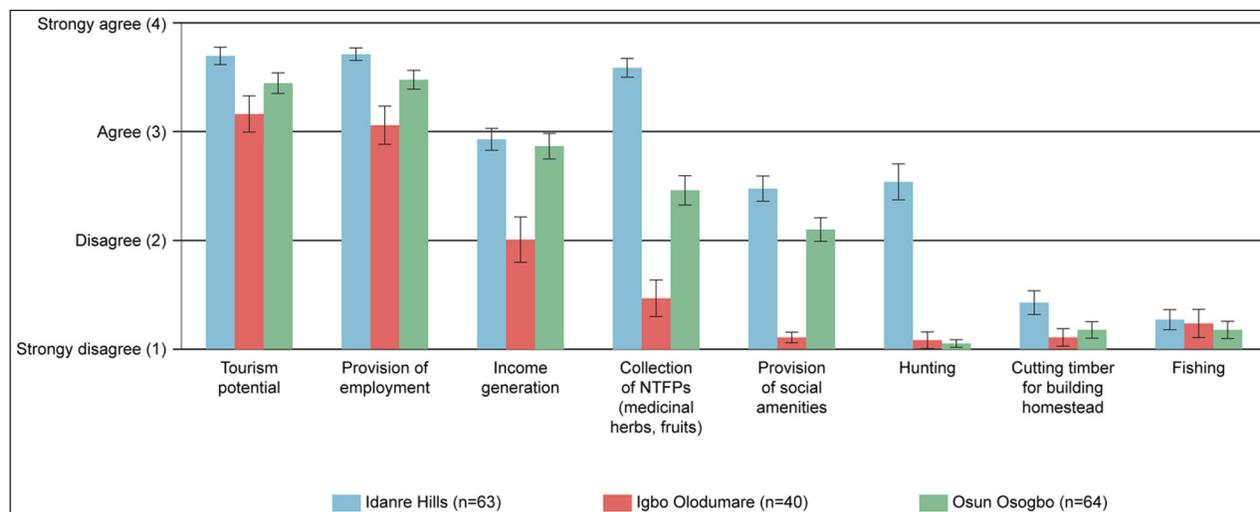
The analysis shows significant differences between the benefit categories (socio-economic and religio-cultural) driving biodiversity conservation among the three sacred groves. Respondents showed varying levels of agreement with the benefits under each category which suggests inter-grove differences. The one-way ANOVA indicates significant differences between the aggregated scores. In general, our data indicate that religio-cultural benefits are more important drivers of biodiversity conservation than socio-economic benefits. We expand on our findings in the following sections.

### 4.1. ECONOMIC GAINS INCREASE LOCAL PEOPLE'S COMMITMENT TO SACRED GROVES' PRESERVATION

Across the three groves, our findings show that the three most significant economic factors driving biodiversity conservation are tourism, income generation, and employment, which are closely interrelated (Figure 2).

Community members gain direct economic benefits from visits by local and international tourists, although the volume of visitors differs for each grove (Adigun et al., 2016; Onyekwelu and Olusola, 2014; Ormsby, 2012b). Local businesses ranging from hotels, eateries, tour guides, transportation companies and other service providers earn a considerable income, as do external businesses that operate temporarily during the festivals (Probst, 2013). One focus group participant (OOSG) explained, “During the festival of Osun or even on ordinary days, people selling ritual materials, the food vendors and drink sellers benefit a lot. The commercial motorcyclist and taxi drivers benefit. Hoteliers and house rentals also benefit. Also, traditionalists use the herbs from the grove for healing and that has become a source of livelihood for them.”

Both Idanre Hills and OOSG have become major tourist destinations. OOSG's Osun Festival annually attracts several thousand visitors – tourists and pilgrims. This international festival has become a multi-million-dollar event sponsored by government and private establishments, especially leading telecommunication and brewery companies (Ogundiran, 2014; Probst, 2013). An estimated 121,000 people participated in the Osun Festival in 2017 while the number of visitors to the grove on non-festival days ranged from 3,800 to 11,000 between 2013 and 2018 (Appendix A).



**Figure 2** Mean scores and standard errors showing respondents' levels of agreement with the question "what are the socio-economic benefits that drive biodiversity conservation" in the three sacred groves using a 4-point scale from strongly disagree (1) to strongly agree (4).

However, reports indicate that funds from the corporate sponsorship were not allocated for grove maintenance (Ogundiran, 2014). In Idanre Hills, the annual patronage of tourists in the Orosun festival ranged from 600 to 8,700 people between 2005 and 2013 (Adigun et al., 2016). The State government has promoted ecotourism in Idanre Hills grove to create cultural awareness and increase patronage (Adigun et al., 2016).

In the case of Igbo Olodumare, the third grove we assessed, most visitors are students from tertiary institutions who visit for sightseeing, education, and research purposes: "When tourists visit, usually students on excursion to the site, villagers sell their farm produce to them. Although this is not regular, the few visits make much difference. Since you sell at a good price to the tourists." (Key informant interview, Igbo Olodumare SG). This and other comments suggest that episodic tourist visits to Igbo-Olodumare are still beneficial to the rural economy even in the absence of large-scale tourism activities.

Moreover, government agencies managing the groves earn revenue from the access fees collected. All visitors, except Osun devotees, pay an entrance fee to OOSG. The income is shared between the NCMM and the Osogbo Cultural Heritage Council (OCHC), headed by the king of Osogbo known by the traditional title – *Ataoja* (NCMM, 2014). In addition, a portion of the revenue is allocated for conservation purposes. In Idanre Hills, the entrance fees contribute to the state's Internally Generated Revenue (IGR), out of which staff salaries and grove maintenance are met (Oladeji and Akinrinola, 2010). A focus group participant (Idanre Hills) opined that "the Hills is a tourist center that generates funds and serves as a revenue source through the community to the government. The community and the local government get their share."

At Idanre, the Usé Festival (annual bat hunting festival) provides income for young men who capture bats that are used in cultural rituals, eaten or sold as bushmeat (Bai et al., 2018). For the Yoruba people, bats are divine messengers (Adebayo, 2017). The bats are protected through local customs which forbid entry into the caves except during the biannual bat festival, thereby ensuring a sustainable bat population. On all other occasions, permission must first be sought from the community leaders before the caves can be visited (Bai et al., 2018). A focus group participant (Idanre Hills) observed that "Usé Festival is one of the rituals in Idanre, which is the killing of bats on the Hills once a year. The bats are sold or eaten by households. One of the bats is also used for prayers for the peace and protection of the community". There is no evidence that the bat population has dwindled due to the ancient practice of bat hunting during the Usé Festival. We conclude that the restriction of bat harvesting to two festive seasons per year account for the stability of the bat population. Scientists have expressed concern about the potential risk of transmitting bat-borne pathogens to humans, given the close human-to-bat contact prevalent during the Usé Festival (Bai et al., 2018). Their concern is that fruit bats and bat flies harbor *Bartonella* strains (*Bartonella rousetti*), a bacterial disease capable of infecting humans. A recent study conducted in Sierra Leone identified *Rousettus aegyptiacus* as the host/reservoir for the Marburg virus, known to cause sporadic outbreaks of diseases with severe symptoms and often high fatalities in humans (Amman et al., 2020). The Republic of Guinea recorded a fatality from the Marburg virus in August 2021 (Okonji et al. 2022). In light of the ongoing COVID-19 pandemic linked to bat-borne SARS-like coronaviruses, relevant health agencies should pay more

attention to festivals like the Usé, to map potential inter-species virus transmission (Mackenzie and Smith, 2020).

Apart from the individual economic benefits derived by residents around the groves, there was scant evidence that tourism revenue had contributed to community development projects such as a community town hall. In fact, respondents held contrasting views on whether revenues are generated, who receives them (if any), and what percentage (if any) is utilized for community development. One focus group participant from Idanre Hills opined: “If any revenue is generated from the Hills, it should be used to develop the place. The money collected, we do not know where they put the money at all, even the road leading to the grove is already bushy.” This widely shared sentiment among residents illustrates the absence of communication between the sacred grove managers (usually government staff) and community residents. The lack of downward accountability creates doubt and suspicion among community members.

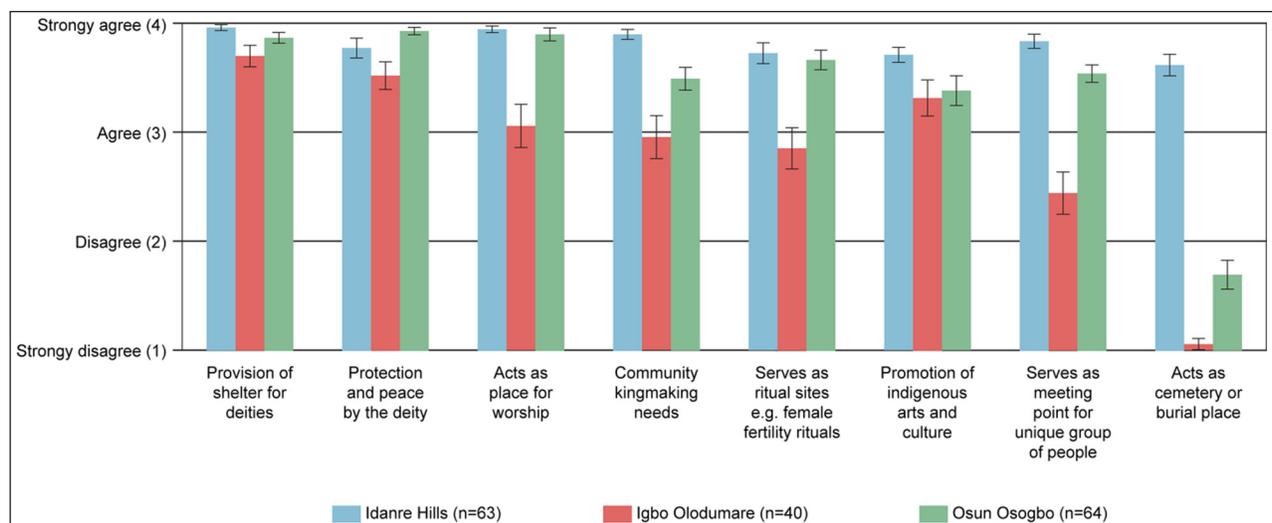
Sacred groves and the associated festivals that generate increases in visitor numbers have encouraged local conservation efforts (Probst, 2013). This finding is consistent with studies in Ghana, India (Ormsby, 2012b), and Nigeria (Onyekwelu and Olusola, 2014), suggesting that economic incentives created by employment, tourism and entry fees encourage local communities to protect sacred groves. At the same time, mass tourism, if not adequately managed, could pose a threat because of solid waste disposal issues, negative ecological impacts and loss of cultural integrity (Ormsby, 2012b; Yusuf, 2016). Due to the large influx of visitors during the festival, the traditional cult in OOSG raised concerns about losing control over access to sacred sites and structures, thereby compromising the secrecy

and privacy necessary for worshipping the Osun goddess (Probst, 2013). In the case of the three sacred groves, the increasing numbers of traditional worshippers and tourists’ patronage have contributed to the continuing relevance of the groves.

#### 4.2. RELIGIO-CULTURAL BENEFITS ARE THE CORE DRIVER OF BIODIVERSITY CONSERVATION IN SACRED GROVES

The respondents across the three sacred groves strongly agreed that religio-cultural benefits are the essential drivers of biodiversity conservation. The three sites share similarities in the religio-cultural benefits, such as usage for traditional and community festivals, places of worship and kingmaking rituals (Figure 3).

At the heart of traditional practices and norms are individual and communal worship of gods and the celebration of traditional festivals (Adebayo, 2016; Probst, 2013). Historical accounts suggest that the origins of both Osogbo and Idanre towns can be traced back to the groves. In the case of OOSG, the annual sacrifices serve both to commemorate the pact and renew the relationship between Osun goddess and the first Ataoja (the traditional title of the Osogbo king) and by extension, with the entire Osogbo people (Ogundiran, 2014; Probst 2016). This ancestral relationship between the Ataoja and the grove is further confirmed by the location of the first and second palaces inside OOSG and the king’s involvement in the 12-day Osun Osogbo festival which takes place in the grove (NCMM, 2005). A focus group participant (OOSG) explained: “Osun Osogbo grove is our place of origin (ancestral home), which must not be destroyed. It houses the worship points, and the spirit of the goddess lives in the grove.” The 12-day



**Figure 3** Mean scores and standard errors showing respondents’ levels of agreement with the question “what are the religio-cultural benefits that drive biodiversity conservation” in the three sacred groves, using a 4-point scale from strongly disagree (1) to strongly agree (4).

festival and associated pilgrimage to OOSG underscore the grove's central role in shaping the cultural identity of Osogbo people, further reinforcing its significance and the rationale for its preservation.

At Idanre Hills, worshippers offer prayers and local chiefs perform ritual sessions. Osogbo people esteem Osun, the river goddess who provides beauty, wealth and fertility for her worshippers (Probst, 2013; Yusuf 2016). A focus group participant (OOSG) noted: *"Some people have received different kinds of benefits from the Osun goddess and they must come back to the grove to pay back their vows annually during Osun Osogbo festival."*

In both OOSG and Idanre Hills, the king and chief priests officiate at special rituals held at midnight in specific parts of each grove. One participant (Idanre Hills) emphasized: *"Even though we have moved downhill, we did not forget the Hills. We still reference the Hills in everything we do, such as the installation of our king, and most of the traditional rites are done on the Hills."* Traditional groups hold their meetings in areas in the sacred groves where tourists are forbidden to enter (Osegale et al., 2014). An example is the Ogboni cult that meets in OOSG every 15 days (3 traditional weeks) and daily during the Osun Osogbo festival (Osegale et al., 2014). Probst (2013) recounted an instance when the Ataoja discounted the religious relevance of the grove and festival as just mere sites of commemoration and remembrance. The Osun priests and religious cults countered Ataoja's view and re-emphasized the grove's traditional religious importance (Probst, 2013), underlining grassroots support.

In OOSG and Idanre Hills, we found widespread awareness of the traditional practices and taboos that protect the groves (notion of sacredness). A focus group participant (OOSG) noted: *"...it is natural when you come here and why it is like that is because they do not allow cutting of trees, killing of animals, and fishing as well."* Through these prohibitions and the sanctions attached to them, the diverse flora and fauna species have been conserved (NCMM, 2005; Oladeji et al., 2021). Recent ecological surveys recorded about 300 monkeys within the core zone of Osun Osogbo Grove (Ogunfolakan et al. 2016). These monkeys are protected as messengers of Osun goddess (Oladeji et al. 2021). Similar studies in the southeastern part of Nigeria confirm that local belief systems have played a huge role in preserving the endangered Sclater's Monkey (*Cercopithecus sclateri*) over many decades (Baker 2013; Baker et al. 2018). In addition, the usage of Akoko (*Newbouldia laevis*) and other tree species including *Erimado* (*Ricinodendron heudelotii*) and Aye trees (*Sterculia rhinopetala*) in traditional and spiritual rites aid in conserving biodiversity (Babalola, 2011; Onyekwelu and Olusola, 2014). The Yoruba people utilize the Akoko leaves in the coronation of traditional rulers and conferment of chieftaincy titles (Babalola, 2011). The

trees in Osun sacred grove are believed to be clothes for Osun goddess while the trees and fishes in the river are considered as her sons and daughters (Oladeji et al., 2021).

In the Igbo-Olodumare grove, some religio-cultural indicators, including the provision of shelter, protection and peace of the deities, received high ratings (Figure 3). However, the influx of immigrant farmers/traders, absence of elders with traditional knowledge, and decline in traditional festival observances threaten the continuing preservation of Igbo-Olodumare. Across Africa and beyond, sacred groves are subject to increasing threats that jeopardize their long-term viability (Bhagwat and Rutte, 2006; Lebbie and Freudenberger, 1996). The encroachment into sacred groves for agricultural cultivation, mining and housing, and widespread conversion to Christianity and Islam in many communities, are the leading threats facing sacred groves (Aniah and Yelfaanibe, 2016; Lebbie and Freudenberger, 1996). Although the actual traditional worship of deities is almost nonexistent at Igbo-Olodumare, an historical myth suggesting the forest hosts a thousand demons is still popular among Igbo-Olodumare residents, and prevents unauthorized access to Igbo-Olodumare grove. In fact, respondents revealed that the only traditional festival celebrated in Igbo-Olodumare had not taken place in the past two decades. This confirms the findings by Onyekwelu and Olusola (2014) that only half of the community perceived the Igbo-Olodumare grove to be a historical and cultural site while fewer than 25 percent considered the grove as the home of the deity and place of worship, hence the low sacredness status assigned to the grove. A contributing factor is that local elders who lead traditional festivals have migrated to bigger communities to live with their adult children. The high number of abandoned mud houses that we counted in Igbo-Olodumare underscored the high migration rate. Since local elders play essential roles in upholding ancient traditions, the increasing diminution in their numbers in Igbo-Olodumare may lead to further deterioration of the sacred nature of the grove and consequent loss of its biodiversity. Looking across to the Republic of Benin, the efforts of local leaders in enforcing traditional taboos and prohibitions prevented migrants and locals from disregarding the traditional beliefs necessary for preserving sacred forests (Ceperley et al., 2010). Studies have shown that an influx of migrants with scant knowledge of the traditional norms of an area may hamper biodiversity conservation (Nganso et al., 2012). Igbo-Olodumare, which has become a hub for immigrant farmers, is now surrounded by farms. If this trend is left unchecked, farms may encroach into the grove. To avoid such an eventuality, immigrants should be educated on the multidimensional significance of the grove and governmental preservation laws put in place to protect the grove.

### 4.3. FORMAL INSTITUTIONAL MANAGEMENT INFLUENCES BIODIVERSITY CONSERVATION ACROSS SACRED GROVES

Our results indicate that the formal institutional<sup>6</sup> management of sacred groves positively impacts the level of protection. Collaborative management of sacred spaces by government institutions and local communities has proven effective in protecting and preserving them (Nganso et al., 2012). Records show that OOSG was almost degraded and deserted in the 1950s, partly due to the rising intolerance of the Yoruba religion among the influential Muslims in the community, resulting in massive encroachment into the grove by farmers and timber companies (Probst, 2009). Meanwhile, traditional beliefs and taboos were in danger of disappearing (Onyekwelu and Olusola, 2014). The revival of traditional cultural practices and subsequent government and UNESCO designation of the grove are credited to Susanne Wenger, an Austrian artist. She moved to Nigeria with her husband in the 1950s (Probst, 2009). Wenger received the blessing of the then Ataoja Adenle, who pushed for the declaration of the grove as a national monument (Probst, 2009). She was later appointed the chief priestess of the Osun goddess and given the Yoruba name, *Adunni Olorisa*. UNESCO recognized her contribution in one of the inscriptions designating OOSG as a World Heritage Site (NCMM, 2005).

The degree of institutionalization of OOSG<sup>7</sup> is not only evident in its designations as Nigerian national monument in 1965, the national museum in the 1990s and UNESCO World Heritage Site in 2005 (Probst, 2013, 2016; Yusuf, 2016) but also in the level of finances, human resources, laws and decrees committed to its protection. The Nigerian Federal government's financial commitment to the grove and festival increased after its designation as a UNESCO site (Probst, 2013). The annual salaries of the 115 NCMM staff members in 2011 was estimated at several million Nigerian Naira (NCMM, 2014). Overstaffing the grove has allegedly led to idleness among some employees (Ogundiran, 2014). The NCMM provided funding for fencing off the buffer zone, in addition to the armed patrols stationed within the grove. However, Ogundiran (2014) argued that government spending has not contributed to the sustainable maintenance and preservation of OOSG due to the neglect of physical structures that are overgrown by weeds.

Moreover, research has shown that government involvement in the day-to-day management of sacred groves could negatively impact local communities' involvement and sense of ownership (Probst, 2013) by alienating them (Akinde, 2018; Aniah and Yelfaanibe, 2016). For example, the official recognition of Igbo-

Olodumare by the Ondo state government was associated with the erection of a boundary fence to protect the site from illegal access. Although fencing may help to prevent human-wildlife conflict and zoonotic disease transmission across the landscape, it may also result in habitat fragmentation, reduced landscape connectivity, wildlife injuries and mortality, and alienation of local people from their cultural heritage (Ferguson and Hanks, 2010; Jakes et al., 2018). Tensions over management rights occasionally occur between traditional leaders and State agencies. For example, in OOSG, there was a conflict between the Ataoja of Osogbo and the NCMM regarding the registration of visitors to the grove. It took the intervention of the International Council of Monuments and Sites (ICOMOS) to resolve the issue (Akinde, 2018). We suggest application of the principle of subsidiarity which means decision making is entrusted to those closest to the resource, ensuring the most effective level of governance. Subsidiarity has been identified in examples of successful management of common pool resources (Marshall, 2007).

The enduring memory of unilateral reservations of forest estates at the state and federal government levels in Nigeria has led to mistrust between local communities and government agencies (Daniel et al., 2016). Some communities in southern Nigeria have rejected government-imposed laws and regulations to protect their sacred sites (Daniel et al., 2016). Despite the often complex and challenging relationship between authorities of formal institutions (e.g. NCMM) and host communities, the distinct and complementary roles played by both levels of management institutions have been critical to the conservation of the groves. As Ogundiran (2014) posits "the challenge remains to balance the good intentions of the State with the needs of the local community in historical, community identity, and spiritual terms" (p. 177).

Looking ahead, Nigeria is a signatory to numerous international conventions and agreements, with different targets set for biodiversity conservation and combating climate change (Federal Ministry of Environment (FME), 2015a; FME, 2015b). Nigeria also committed to sustainably managing at least 10 percent of its national territory as conservation areas by 2020 (FME, 2015a). Integrating sacred groves into the national biodiversity policy framework in Nigeria could assist the country in achieving its long-term national biodiversity targets, as has been done in the Tibetan region in western China and British Columbia in Canada (Samakov and Berkes, 2017). Such recognition would demonstrate Nigeria's commitment to conserving its dwindling natural resources and affirm the relational values that link the Yoruba and other peoples to their sacred groves.

## 5. CONCLUSIONS AND RECOMMENDATIONS

Our research has established that religio-cultural values associated with the groves serve as critical motivations for their protection, albeit to varying extents. As long as the groves remain central to the identity of the Yoruba people, the groves and their biodiversity will remain relevant. For example, the leaves of the Akoko tree are a required element in the coronation of Yoruba kings. However, the dwindling adherence to traditional beliefs and practices, migration to urban areas by the elderly population, expansion of industrial farmland, and the concomitant increase in migrant workers (particularly in Igbo-Olodumare) confirm the need for continuing involvement of government institutions in the management of sacred groves. Hence, a mix of customary and formal institutional management that combine cultural norms and prohibitions and state-enforced rules is critical to biodiversity conservation. Both types of institutional arrangements have complemented each other over the past decades and help to explain the resilience of sacred groves in Nigeria. As far as possible, we recommend that the principle of subsidiarity be followed to recognize and involve local communities in decision-making for the improved management of the groves. Local cultural organizations could document and promote intergenerational knowledge, so as to pass traditional knowledge on to younger generations.

We also found that economic incentives from tourism, employment opportunities and income generation activities contribute to successful biodiversity conservation. Residents of OOSG and Idanre hills benefit from big festivals associated with the grove, while in Igbo-Olodumare local people value the opportunistic economic benefits derived from the occasional visits from tourists. However, it was unclear to the community members interviewed in all three groves how the respective administrators managed or utilized revenue from the grove.

Therefore, our research indicates the need for transparency in sharing and utilizing tourism revenues in host communities. We suggest that government officials improve communication channels and meet regularly with community members to demonstrate accountability and transparency in management decisions. Communities would welcome official recognition of their rights and shared decision-making with government agencies. Further, the State should engage relevant stakeholders, especially communities affected by outright fencing of the grove, to work out solutions that guarantee community access and support biodiversity protection. Relatedly, we recommend that state and federal governments should incentivize the setting aside of land for restoration in areas adjacent to each grove as part of a strategy to provide corridors for wildlife migration. The long-term resilience of the sacred

groves depends in equal measure on governance reforms and effective conservation measures.

## NOTES

- 1 Excludability means the ease with which others can be kept from using the resource. In some sacred groves, it is costly to exclude other users because no person or community owns the sacred site; the guardian spirit of the place is the main owner; see Rutte, 2011, 2389; Samakov and Berkes, 2017, 437 and 439. Subtractability means that one person's use of the resource diminishes the amount available to others. Although this applies to resources in sacred groves, local beliefs also suggest that the more people revere a sacred site, the stronger is the power of that site (i.e. the power of the site is virtually non-subtractable and possibly increases with use); see Samakov and Berkes, 2017, 439 and 441.
- 2 First author's observation.
- 3 In Igbo-Olodumare, we could only find 40 respondents to participate in this study due to the small number of community members.
- 4 US Dollar conversion to Nigerian Naira: 1 USD = 415.65 Nigerian Naira in April 8, 2022.
- 5 In this paper, migrants are those who migrated to the community while natives are those who were born and raised in and have ancestral connections to the community.
- 6 We define "formal institution" as the rules that guide access, control and management of multi-user resources, and which are backed and enforced by the State (Yami et al., 2009).
- 7 There are three layers of institutional authority for the grove, according to Ogundiran (2014), which are arranged in the following hierarchical order: (1) The federal government of Nigeria, through NCMM is responsible for the overall management of the grove; (2) Osun State government and Osogbo and Olorunda local governments; and (3) Osogbo community, as governed via the traditional authority of the Ataoja of Osogbo and the Osun chief priestess.

## ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Appendix A.** Visitor Statistics to Osun Osogbo Sacred Grove between 2013 and 2018. DOI: <https://doi.org/10.5334/ijc.1143.s1>

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## COMPETING INTERESTS

The authors have no competing interests to declare.

## AUTHOR AFFILIATIONS

**Samuel Oluwanisola Adeyanju**  [orcid.org/0000-0002-7506-1591](https://orcid.org/0000-0002-7506-1591)

University of British Columbia, CA

**Janette Bulkan**  [orcid.org/0000-0003-2261-484X](https://orcid.org/0000-0003-2261-484X)

University of British Columbia, CA

**Jonathan C. Onyekwelu**  [orcid.org/0000-0003-1473-178X](https://orcid.org/0000-0003-1473-178X)

The Federal University of Technology, Akure, NG

**Guillaume Peterson St-Laurent**  [orcid.org/0000-0002-1329-0954](https://orcid.org/0000-0002-1329-0954)

University of British Columbia, CA

**Robert Kozak**

University of British Columbia, CA

**Terry Sunderland**  [orcid.org/0000-0002-1985-9849](https://orcid.org/0000-0002-1985-9849)

University of British Columbia, CA

**Bernd Stimm**  [orcid.org/0000-0003-4808-1893](https://orcid.org/0000-0003-4808-1893)

Technical University of Munich, DE

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