

Financing Biodiversity Conservation in Namibian National Parks

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Abstract

Funding for biodiversity conservation is insufficient, necessitating innovative strategies to secure additional financial resources. This paper has three main objectives, namely, to assess the impact of funding on financial stability, to analyse the effect of sales revenue on financial stability and to examine the influence of financial management on financial stability of the biodiversity conservation in Namibia's national parks. The study based on the philosophy of pragmatism, used a quantitative research approach, and employed a concurrent research design. The study employed various analytical tools to analyse the data, precisely the PLS-SEM in SmartPLS 4 software. The study ensured reliability in terms of internal consistency using the Cronbach's alpha and composite reliability using omega-a (ρ_a), used convergent validity based on the factor loading of the indicators and the average variance extracted (AVE), as well as discriminant validity using the Fornell-Lacker and Heterotrait-monotrait (HTMT) ratios. The findings advocate for adaptable and scalable solutions that can be tailored to different national parks, considering their unique ecological, social, and economic contexts. Specific contributions made by the study to the literature are examining the potential for innovative financing mechanisms, such as green bonds or conservation finance funds, to mobilise additional resources for biodiversity conservation in Namibia's national parks. Furthermore, the study contributed by evaluating the impact of economic incentives, such as tax incentives or subsidies, on promoting conservation practices within Namibia's national parks and promoting sustainable financing models.

Keywords

Sustainable Financing, Biodiversity Conservation, National Parks

1. Introduction

Namibia, celebrated for its remarkable biodiversity and extensive protected areas,

faces pressing challenges in maintaining and enhancing its natural heritage [1]. National parks in Namibia harbour unique ecosystems and a rich variety of flora and fauna, which are vital not only to global biodiversity but also to the socio-economic development of the country [2]. Sustainable financing mechanisms are crucial to ensure the ongoing conservation and management of these protected areas, especially in the face of increasing environmental threats and financial constraints [3]. Namibia's national parks, such as Etosha, Namib-Naukluft, and Bwabwata, among others, play a critical role in conserving biodiversity [4]. [2] further adds that these parks are home to iconic species such as the African elephant, black rhino, cheetah, and an array of endemic plant species. It is also essential for providing ecosystem services like clean water, climate, and soil fertility [5]. Sustainable biodiversity conservation in Namibia's national parks necessitates innovative and multi-faceted financial strategies to ensure the enduring protection of its unique natural heritage [4]. By implementing a comprehensive sustainable financing, Namibia can better safeguard its biodiversity against ecological and economic challenges, thereby contributing to global conservation efforts and enhancing the socio-economic well-being of its people. This present research aimed to provide a robust foundation for these initiatives, thereby addressing the urgent need for long-term financial sustainability in the conservation sector.

2. Literature Review

2.1. The Impact of Funding on the Financial Stability of the Biodiversity Conservation

Biodiversity conservation is crucial for the maintenance of ecological balance, socio-economic welfare, and sustainable development. Namibia, celebrated for its diverse wildlife and conservation initiatives, heavily relies on both domestic and international funding to sustain its conservation efforts. This literature review examines the empirical evidence on how funding impacts the financial stability of biodiversity conservation initiatives in Namibia. A growing body of research has been examining the impact of funding on the financial stability of biodiversity conservation efforts. A number of studies have examined the topic, including research conducted by [3] [6]-[10].

Specifically, a Namibian study by [3] on sustainability financing identified the financial instruments that could bridge the biodiversity funding gap. The study found that while Namibia economically benefits from its biodiversity, current reinvestment into biodiversity does not match these benefits. As a result, ecosystems are continuously being degraded, thus impairing their ability to support the economic and social services and products they currently sustain.

Likewise, [9] examined the cultural benefits provided by non-market ecosystem services, thereby offering previously unknown insights useful for conservation decision-making. The study revealed that fostering a sense of place can yield positive outcomes for both human well-being and biodiversity conservation. This aligns

with the conclusions of [3], in which ecosystems are in a state of continuous degradation, compromising the services and products essential for economic and social development.

[10] studied the Vietnam BIOFIN assembling incomes for biodiversity and sustainable growth, which offered an integrated analytical framework to help Vietnam evaluate its current financial flows for biodiversity conservation. This framework aids in creating effective action plans and mechanisms to gather additional and sufficient funds to meet national biodiversity targets both in the short and long term. Findings from the Biodiversity Expenditure Review indicate that the majority of biodiversity funding in Vietnam comes primarily from government budgets, followed by contributions from social resources and the private sector. [8] evaluated the economic significance of shark and ray tourism in Indonesia, as well as tourists' preferences and local community opinions. The researchers found that local shark fishermen are not well-equipped to directly benefit from this type of tourism, which could potentially have both positive and negative impacts on shark and ray conservation efforts.

Furthermore, [6] attempted to determine the importance of funding. The study aimed to highlight the significance of funding for conservation efforts. Conducted in Nigeria, the research focused on the Andean hypersaline lakes in northern Chile's Atacama Desert, titled "Between lithium exploitation and unique biodiversity conservation". The findings revealed that these hypersaline lakes, or brine waterbodies, are one-of-a-kind ecosystems that provide both economic and non-economic benefits, thereby making them valuable and deserving of conservation efforts. Similarly, these results were supported by the findings of [8], which outline that the main danger to shark populations is overfishing, and neglecting to effectively collaborate with and motivate key stakeholders in the industry will undermine the success of Indonesia's efforts to conserve sharks. [7] emphasised the need to integrate insights from three distinct approaches in natural science, quantitative social science, and qualitative social science/humanities to understand the link between cultural values and biodiversity conservation. They argue that to fully grasp this relationship, it is essential to employ interpretivist approaches such as phenomenology alongside other methodologies.

In summary, the existing empirical literature [3] [6]-[10]; on this topic has primarily focused on countries like Nigeria, Indonesia, Guinea, and Vietnam. There is a notable lack of rigorous research specifically addressing the influence of funding on the financial stability of biodiversity conservation within the context of Namibia. Consequently, generalising findings from other countries based on the erroneous notion of a "one size fits all" approach can lead to false conclusions, given the differing geographic features, the sizes of national parks, development standards (developed vs. developing), and other country-specific factors. According to [11] taxonomy of research gaps, this represents an empirical gap. The present study's intent was to address this gap by concentrating on the perspective of the Namibian phenomenon. In that view, this study hypothesises

that:

H1: Funding has a positive impact on the financial stability for the biodiversity conservation of national parks in Namibia.

2.2. The Effect of Sales Revenue on Financial Stability of the Biodiversity Conservation

Biodiversity conservation is a multifaceted endeavour involving ecological, economic, and social dimensions. A critical component of successful conservation is its financial sustainability. In Namibia, sales revenue generated from activities such as ecotourism, sustainable wildlife trade, and park entry fees plays a significant role in funding conservation efforts. This literature review synthesises empirical evidence on how sales revenue impacts the financial stability of biodiversity conservation initiatives in Namibia. The impact of sales revenue on the financial stability of biodiversity conservation has been a significant focus of research. Several empirical studies in this field, including those by [12]-[21] are summarised below:

Research by [20] highlights that Namibia's community-based conservancies have benefited significantly from the regulated trade of game species, which has translated into increased funding for local conservation activities. A study by [12] showed that ecotourism-related activities such as guided wildlife tours, lodge stays, and conservation safaris, provide critical financial resources. These revenues contribute to the funding of anti-poaching efforts, habitat restoration, and community development projects. [19] pinpointed the essential elements for delivering unforgettable tourism experiences at the Namib Sand Sea World Heritage Site in Namibia. Their study reveals a direct relationship between memorable experiences and seven key heritage factors, which collectively contribute to increased revenue as they enhance the quality of the experience.

Additionally, [18] developed a general visitor profile and described the motivational factors for visiting Mapungubwe National Park (MNP) to support tourism development. The study primarily included first-time visitors and identified heritage and education as unique motivational factors. These results align with those of [19], suggesting that increased visitor motivation leads to higher revenue. Satisfied visitors are more likely to revisit or promote the destination, thereby increasing revenue.

[14] examined the factors influencing the revisit intentions of Vietnamese tourists to Korea using a mixed-method approach that incorporated both qualitative and quantitative methodologies. The study's findings confirmed the factors identified by earlier research and provided valuable information for marketing executives to develop strategies not only to attract more visitors for repeat visits but also to encourage them to promote the destination to new visitors. Moreover, [15] explored the influence of tourists' emotional responses toward a destination on their satisfaction and loyalty to that destination, with perceived quality acting as a moderating variable. Using quantitative data collection methods, the study found that

negative emotions have a detrimental impact. The findings highlight the crucial role emotions play in tourists' decision-making, as they affect satisfaction and subsequently influence future decisions, such as loyalty or disloyalty to a destination. These results align with the findings of [18] and [14].

[12] highlighted the effectiveness of the newly implemented automated revenue collection system in the Etosha National Park in Namibia, demonstrating its success. This expressive study revealed a need for additional training on the system to improve user acceptance. Similarly, [13] analysed the socio-economic impact of tourism businesses on the community of Nau-Aib in Okahandja, Namibia. Their socio-economic impact assessment provided insights into the broad effects of tourism on the community's social and economic well-being. These findings are consistent with those of [12], who also emphasised the importance of stakeholder engagement in the system.

In a related vein, [16] investigated tourists' willingness to pay (WTP) for quality improvements in Komodo National Park, Indonesia, alongside their willingness to contribute (WTC) to conservation efforts. Using cross-tab data analysis techniques and Chi-Square tests, the study identified factors affecting both WTP and WTC. This research is comparable to the work of [13], which also focused on the socio-economic impacts of tourism. The results indicated that marital status and occupation are key factors influencing tourists' willingness to pay (WTP), while age is significantly associated with their willingness to contribute (WTC). [17] assessed the tourism appeal and performance of national parks in Vietnam, resulting in developing a new index to measure their attractiveness. The research revealed that Phong Nha-Ke Bang, Cuc Phuong, and Ba Be national parks stood out as the most appealing to tourists. Additionally, the analysis showed that many parks were considered non-dominated, with the trail criterion playing a key role in making most of these parks attractive to visitors.

The researcher identified a clear knowledge gap in previous studies related to sales revenue from sources other than tourists, such as ecosystem services, environmental levies, ecolabelling, and environmental lottery. Moreover, prior research has largely overlooked the impact of revenue on financial stability, focusing instead on factors affecting sales revenue. This presents several unexamined areas that have recently garnered research interest in other fields [12] [13]. To understand the impact of revenue on financial stability better, further exploration is required, as this aspect has not been adequately addressed by studies such as those by [11] [16]-[19]. Financial stability in biodiversity conservation refers to the consistent availability of funds required to support ongoing conservation activities. Sales revenue directly influences this stability through its consistency, scale, and linkage to specific conservation outcomes. Considering these points, this study hypothesises:

H2: Sales revenue positively influences financial stability for biodiversity conservation in national parks.

2.3. The Influence of Financial Management on Financial Stability for Biodiversity Conservation

Financial management in the context of biodiversity conservation encompasses budgeting, financial planning, financial monitoring, reporting, and risk management. Proper financial management ensures the efficient and effective use of available funds, thereby enhancing the sustainability of conservation projects. This literature review aims to examine the empirical evidence on how financial management practices influence the financial stability of biodiversity conservation efforts in Namibia. There is an expanding body of literature examining the impact of financial management on financial stability, including works by [22]-[30].

[22] examined the factors influencing the financial sustainability of civil society organisations in Namibia. By utilising primary data gathered through structured questionnaires, the research aimed to identify the key determinants of financial viability for these organisations. The research discovered that the financial stability of Namibian non-profit organisations is heavily influenced by five key factors: having multiple income streams, generating sufficient income, effective financial management, maintaining strong relationships with donors, and possessing competent management skills. Moreover, [23] explored the relationship between financial development and economic growth in Namibia. The study revealed that real interest rates and savings have a negative and statistically insignificant relationship with economic activity. These findings are similar to those of [22], as both discuss constraints related to financial management.

Additionally, [24] took a different approach by developing a baseline for biodiversity expenditure in Namibia. This study estimated expenditure on biodiversity conservation, disaggregated by its source, and projected a baseline for “business as usual” biodiversity expenditure over the period covered by NBSAP2. The results highlighted a significant need to more effectively integrate biodiversity considerations into the Namibian government’s accounting, budgeting, and planning processes, as well as within the private sector.

Similarly, [25] carried out a study to evaluate the effects of monetary learning on the performance of small and medium businesses in Windhoek. The findings revealed that attending financial literacy training significantly enhances the composite score index of financial knowledge. Additionally, obtaining tertiary education markedly boosts the financial knowledge index. Hence, the study confirms that both participation in financial literacy programs and higher educational attainment improve the financial knowledge levels of SMEs. Although the present study does not focus specifically on conservation, it provides insights into the financial management of state-owned enterprises. These findings are consistent with those reported by [22] and [23].

In addition, [26] explored four distinct definitions of sustainable development and examined how these different conceptual frameworks are utilised by political actors to pursue specific agendas. The analysis indicates that the conventional economic cost-benefit approach, often used to assign value to ecosystem services for

conservation purposes, fails to adequately address the interchanges between immediate economic gains and lasting societal interests. The study contends that the general public has a limited understanding of what sustainable development truly means, typically associating it primarily with environmental protection, nature, and biodiversity conservation. These findings align with those of [24], as both sets of research highlight the literacy and comprehension levels of the individuals involved.

A study by [24] explored the concepts of reference states and benchmarks to improve biodiversity conservation in modern ecosystems. They developed a conceptual framework designed to guide philosophical discussions and practical applications of these reference states. This framework offers policymakers and practitioners a practical means to conduct biodiversity valuations, aiming to optimise conservation and restoration results in today's biodiversity.

Similarly, [29] examined standardised reporting on costs associated with management interventions for biodiversity. The study established that effective conservation efforts must address threats and produce benefits within the constraints of limited budgets. [29] recommends that researchers and practitioners provide comprehensive contextual information along with cost data to ensure that it is interpretable by readers and future users. These recommendations align with the principles highlighted by [27], as both emphasise the importance of robust reporting systems. [30] proposed a model for managing natural environments within national parks in Poland, particularly in the face of growing tourist activity. The study's findings suggest that successful park management requires a well-crafted conservation plan. Additionally, accurate financial reporting depends on monitoring environmental conditions, the volume and trends of tourist traffic, and the impact of tourism on the environment.

Lastly, [28] took a different approach by investigating the impacts of the COVID-19 epidemic on preservation investigation, administration, and community assignation in United States protected areas. This study offers valuable observations and educations that could advance similar efforts in protected areas globally. The pandemic and post-pandemic periods present a unique opportunity to explore how shifts in management practices, research activities, visitation levels, and tourist's assignation influence the wellbeing of protected areas and experiences of both visitors and employees of the park. The gathered data can inform the development of more targeted and effective strategies for conservation research, area management, and community outreach initiatives in protected zones.

The researcher highlighted a significant evidence gap in previous studies concerning the influence of financial management on financial stability. While earlier research has explored various aspects of accountability regarding fund mismanagement and budget adherence [24] [27] [28] as well as profitability and the ability to meet short-term and long-term obligations [23] [25] [29], inconsistencies in the findings were identified [11]. Financial stability in biodiversity conservation refers to the continuous and reliable availability of financial resources necessary

to carry out conservation activities effectively. Empirical evidence suggests that sound financial management positively influences this stability through several mechanisms. Based on this understanding, the current study posits the following hypothesis:

H3: Financial management positively influences financial stability in biodiversity conservation within national parks.

2.4. Conceptual Framework

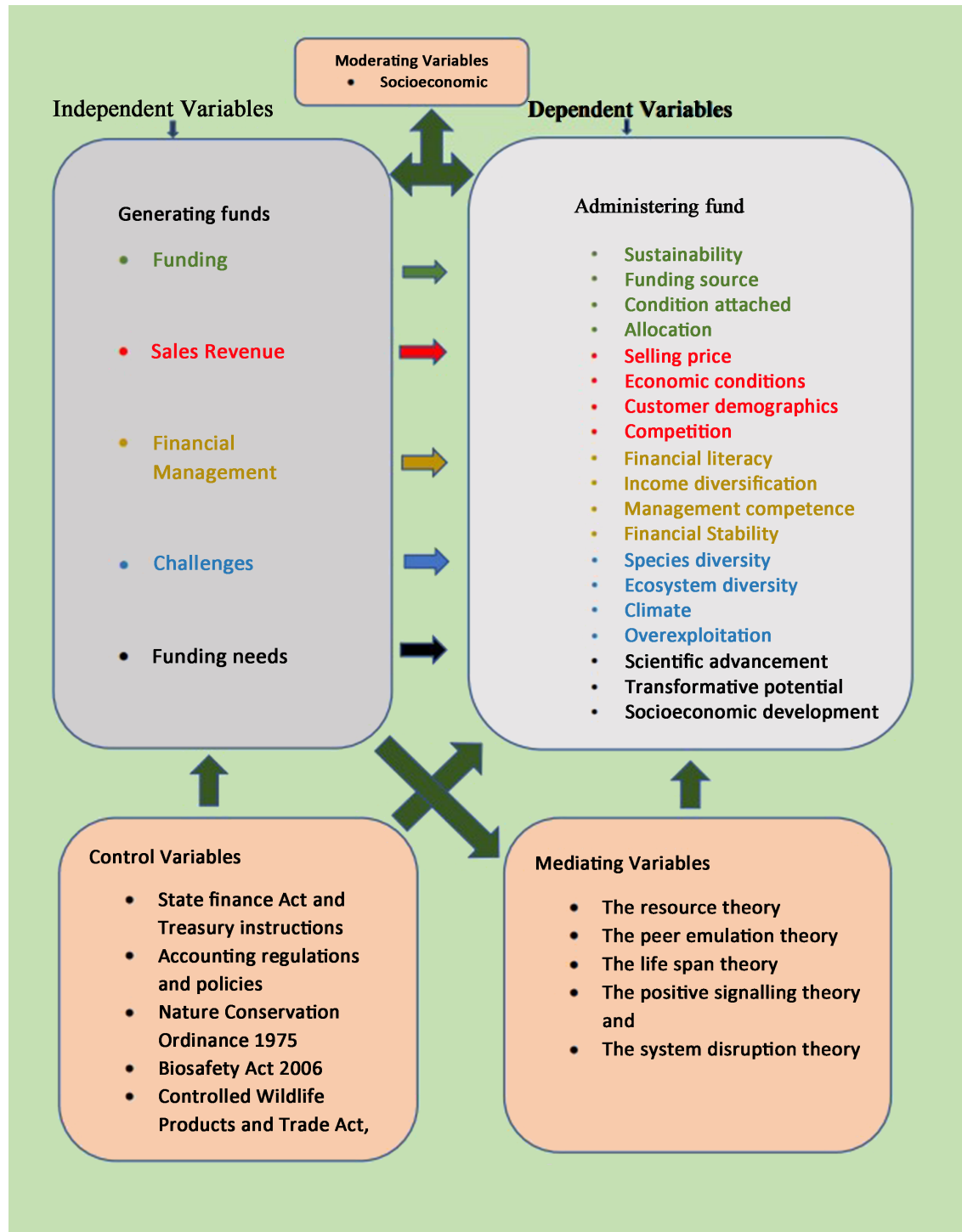
The conceptual framework depicted in **Figure 1** illustrates the various types of variables used in the analysis, including independent variables that influence the outcome, dependent variables that are being measured, control variables that are held constant to ensure accurate results, moderating variables that alter the relationship between other variables, and mediating variables that transmit the effect of one variable to another. Independent variables are key variables adapted from the research questions, and the dependent variables are the measurable outcomes of administering biodiversity conservation funds, while the control variables include different regulations that influence both the independent and dependent variables [31]. According to [32], there is a positive relationship between administering funds and generating funds. Crompton further argues that for effective sustainable finance, the high the fund generated, the more hectic it takes to administer it and the better the sustainability of financing. A robust and efficient legal framework will influence how effectively the available financial resources can ensure financial stability [33]. The legal framework (see **Figure 1**) here entails adequate policies, guidelines, and regulations that govern the functioning of the sustainable financing for biodiversity conservation.

Figure 1 illustrates that sustainable theories impact the strength of the relationship between the dependent and independent. Example, for funding to lead to sustainability Namibia may look at how countries of the same class (peer emulation theory) are doing it and decide basing on that. The mediators (sustainable finance theories) explained the connection between variables.

The study found one strong moderator which affects almost all the decisions involved and that variable is the socioeconomic variable. The socioeconomic variable acts as a moderator, shaping both the direction and strength of the connection between each independent variable and the dependent variable. For example, socioeconomics is working as a moderator of the relationship between funding and source of funding. For funding to decide on the source of funding, the economic social class of the country must first be determined.

Therefore, the framework recommends effective financial management as an instrument for administering funds through the control variables. Effective administration of funding resources can enable the national parks to uphold financial stability of biodiversity conservation, which leads to sustainable financing. In summary, the constructed framework is an effort to support biodiversity to attract more funding to stimulate economic growth of Namibia. This study adapted the

conceptual framework in **Figure 1**, for identifying dimensions of *financing for biodiversity conservation in Namibian national parks*. This framework was enhanced and verified by the researcher, for it to meet the context of the sustainable financing for biodiversity conservation.



Source: Own compilation (2023).

Figure 1. Conceptual framework of the study.

3. Research Methods

3.1. Research Philosophy

This research was based on the pragmatism philosophy, which enabled the study to acquire diverse realities of the phenomenon that the study investigated.

3.2. Research Approach

This study used a quantitative research approach to examine the phenomena from quantitative perspective. The quantitative approach was used to assess the impact of funding on the financial stability of the biodiversity conservation in Namibian national parks, the effects of financial management on financial stability of the biodiversity conservation in Namibian national parks, and the influence of sales revenue on financial stability of the biodiversity conservation within Namibian national parks.

3.3. Research Design

This research aimed to first examine the phenomena using quantitative methods. Therefore, the study used a concurrent research design, which allows the study to integrate different types of data to gain a more comprehensive understanding of the research problem within one study [34] [35].

3.4. Population of the Study

This study focused on the representatives of the national parks which are state-owned and whose management is mainly biodiversity conservation dominated. Although there are many stakeholders within the MEFT, for convenience purposes, only employees that are responsible for parks management were involved in the study. According to the Ministry of Environment, Forestry and Tourism database [36], the total population that is responsible for parks management is sixty-three. The study's targeted a population of all 63 employees responsible for national parks management in Namibia. The main categories of the staff in this study are classified as chief control wardens, chief wardens, accountants, park wardens and rangers.

In detail, the parks are categorised into five regions as per direction of the map, Central, Northern, Southern, Western and North-East region. The MEFT directorate of DWNP indicates that there were twelve registered national parks in Namibia in the year 2023 [36]. The twelve national parks include the Etosha National Park, Bwabwata National Park, Namib Naukluft National Park, Waterberg Plateau Park, Dorob National Park, Tsau/Khaeb National Park, Skeleton Coast Park, Ai-Ais national Park, Mudumu National Park, Khaudum National Park, Nkasa Rupara National Park, Mangetti National Park. The 12 national parks are categorised into four thematic features (landscape, desert, games, and river). Two are valued for their landscape (Waterberg Plateau Park and Dorob National Park), three are in the vicinity of a river (Bwabwata, Nkasa Rupara, Mudumu), and four are within the desert (Namib-Naukluft Park, Ai-Ais national Park, Tsau/Khaeb

National Park and Skeleton Coast Park). The remaining three parks are engrossed for their games (Etosha National Park, Khaudum National Park, Mangetti National Park).

3.5. Sampling and Sample Size

This research used a census sampling approach, sometimes referred to as a full enumeration survey method, to determine the quantitative sample size since the population size is small. This approach facilitates the inclusion of the complete population and is crucial for mitigating bias resulting from the researcher's limited control over sample selection [37]. [35] emphasises that using total population sampling enables researchers to make generalisations about the entire population being studied, thereby increasing the accuracy and applicability of the research findings. Therefore, this research made the sample size equal to the population size, resulting in a sample of 63 employees who manage the National Parks.

3.6. Research Instruments

The study used an online structured questionnaire produced using Google Forms. The instrument is crucial as it enables the researcher to make necessary modifications and allows the participants to easily provide their responses [34]. The survey consisted of a series of closed-ended questions that were answered using a multiple-choice format. The questions were designed to be answered on a Likert scale, which ranged from 1 to 5. A score of 1 indicated a low level of agreement or frequency, while a score of 5 indicated a high level of agreement or frequency. Consequently, the research partitioned the questionnaire into five sections.

Section A provided a comprehensive analysis of the participants' demographic data, including the national park represented, gender, academic qualifications, position, and years of work experience. Section B primarily examined the impact of funding on financial stability of the biodiversity conservation with closed-ended questions measured on a Likert scale of 5 points (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

Section C examined the influence of sales revenue on the financial stability of the biodiversity conservation, also using closed-ended questions measured on a Likert scale of 5 points (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Section D sought to assess the effects of financial management on the financial stability of the biodiversity conservation. The part included a series of carefully formulated closed-ended questions, which were assessed using a Likert scale consisting of 5 points (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Finally, Section E which sought to examine aspects of the financial stability of the park, also using closed-ended questions measured on a Likert scale of 5 points (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

3.7. Data Analysis

The study commenced with data screening using Microsoft Excel Sheets to address missing data and unresponsive answers. Afterwards, the study used a frequency analysis on categorical data to determine the characteristics of the participants using the Excel Sheet. Subsequently, the study used descriptive analysis and performed skewness and kurtosis tests to test for normality using SmartPLS 4 software. These tests were used to ascertain the characteristics of ordinal data and evaluate the extent to which the data adheres to a normal distribution. Furthermore, the study used factor analysis to establish the connection between the measurement items and their respective factors, as well as collinearity test to evaluate the extent of multicollinearity among the variables using SmartPLS 4 software. For the in-depth analysis, the research used the partial least squares-based structural equation modelling (PLS-SEM) in SmartPLS 4 software. This served to analyse the impacts of funding, financial management, and sales revenue on financial stability of the biodiversity conservation. The study opted to use the PLS-SEM because it is more applicable for small samples, such as the sample size of this study, unlike the covariance-based SEM that requires a large sample [38].

3.8. Reliability, Validity, and Trustworthiness of the Study

Within that particular context, the research assessed the reliability and validity of the components.

3.8.1. Reliability of the Study

The study assessed reliability in terms of internal consistency using Cronbach's alpha and composite reliability using omega-a (ρ_a). The Cronbach's alpha coefficient values have a range of 0 to 1. Higher values indicate a greater level of internal consistency [39]. However, values that above 0.90 are not desired, and those that beyond 0.95 are considered unsatisfactory [40]. Therefore, this research only considered constructs with values ranging from 0.7 to 0.9. Briefly, the study conducted a pilot study with 30 employees of the national parks who did not form part of the final sample. This was essential to determine the instrument's reliability and validity. Results from the pilot study reveal two constructs with Cronbach's alpha values below 0.70. With that in mind, the research eliminated several measurement items, as recommended by the software to verify the internal consistency of the instrument. Ultimately, the composite reliability is ensured when score of omega-a (ρ_a) is at least 0.70 [40] [41].

3.8.2. Validity of the Study

This study employed convergent and discriminant validity. In this regard, the study validated convergence based on the factor loading of the indicators and the average variance extracted (AVE) in SmartPLS 4 software, which should surpass 0.50 [40] [41]. Furthermore, the research assessed the discriminant validity by using the Fornell-Lacker and Heterotrait-monotrait (HTMT) ratios, also in SmartPLS 4

software. Regarding the Fornell-Lacker ratio, the square root of each average variance extracted (AVE) should exceed the correlation coefficient for each construct in the corresponding rows and columns to ensure validity [42]. Additionally, the HTMT ratio of correlation should not exceed 0.85.

4. Results

4.1. Data Analysis

This section serves to analyse the data of the study which is quantitative. The section assesses the response rate, screened the data, and performed the frequency analysis on the respondents' description. The subsequent section outlines the methodology used to analyse the data, which includes descriptive statistics, normality tests, factor analysis to identify underlying patterns, examination of collinearity among variables, the assessment of model fit, reliability testing to gauge the consistency of the measurements, validity testing to ensure the accuracy of the inferences, and finally, structural equation modelling to examine the relationships between variables. The next subsection specifically focuses on the response rate.

4.2. Response Rate

The sample targeted for the quantitative aspect was 63 employees of the National Parks in Namibia. However, the study received only 60 responses, accounting for 95% of the sample size. According to [43], a response rate that is 50% of the targeted sample is suitable, 60% is reliable, while 70% is excellent. Since the response rate of this study is 95%, the study considers it adequate for the analysis. To guarantee that the data was suitable for analysis, the study conducted a series of preliminary checks as outlined below, aiming to ensure that the data aligned with the proposed analytical framework.

4.3. Data Scrutinising

In order to verify its suitability for analysis by identifying and addressing any missing values and non-response biases, the study scrutinised the data. To detect the missing data, the study applied the "Count Blank" function in Microsoft Excel Sheet, where a non-zero value implies that there are missing data in the data. However, the screening reveals no missing data in dataset, because the study used an online instrument whereby all questions requirement was compulsory to prevent the respondents from continuing to the next questions before completing the prior ones. In terms of detecting unengaged responses, standard deviation of sample (STDEV.S) was used in the study to function in Microsoft excel sheet, where a value of zero is an indication of an unengaged response, which should be removed from the dataset [44]. Based on the results, the study found four unengaged responses which were removed from the dataset as recommended by [44]. This did not affect the adequacy as it is still within the range of 0.01%. The next section focuses on the description of the respondents.

4.4. Description of the Respondents

The study employed the “Countif” function in Microsoft Excel Sheet to determine the occurrences of categorical data. In light of that, the results presented in **Table 1** show that the data were collected from four national parks in Namibia. The Namib-Naukluft National Park received the highest representation rate of 30%, followed by Bwabwata National Park (25%), Etosha National Park (23.33%), and Waterberg Plateau Park (21.67%). Overall, the results demonstrate a fair representation of the parks, which implies the accuracy of the data, and the data did not exhibit a significant bias or skew towards any particular value park. This also enables the generalisations of the findings across the National Parks. Regarding gender, the results show that the majority of the respondents represented the male gender (66.67%), while the rest represented the female gender (33.33%). This is because the national parks have more male employees than females.

In terms of qualifications, the respondents had at least a national certificate, with those holding a bachelor’s degree having the highest representation rate of 28.33% and master’s degree holders having the lowest representation rate of 1.67%. These results demonstrate that the data were collected from people with an adequate educational background, which enabled them to comprehend the questions and provide accurate data.

In reference to the positions held, the results indicate that the study covered employees at different positions, which include ranger (48.33%), warden (23.33%), accountant (15%), control warden (6.67%), and chief warden (6.67%). The wider representation of employees at different levels signifies the accuracy of the data and enables generalisations of the findings across the national parks.

Finally, evidence of experience shows that the study collected the data from employees with experience ranging from less than 5 years to those with over 20 years of work experience. In that light, 71.28% of the respondents had at least 5 years work experience to over 20 years. These findings indicate that data were collected from employees with adequate experience, which enhances data accuracy.

Table 1. Description of the respondents.

	Frequency (N = 60)	Percentage (100%)
Park Represented		
Waterberg Plateau Park	13	21.67
Namib-Naukluft National Park	18	30.00
Etosha National Park	14	23.33
Bwabwata National Park	15	25.00
Gender		
Male	40	66.67
Female	20	33.33
Qualifications		
National Certificate	16	26.67

Continued

Diploma	12	20.00
Bachelor's Degree	17	28.33
Honour's Degree	14	23.33
Master's Degree	1	1.67
Position		
Warden	14	23.33
Ranger	29	48.33
Accountant	9	15.00
Control Warden	4	6.67
Chief Warden	4	6.67
Experience		
Less than 5 years	17	28.33
5 - 10 years	19	31.67
11 - 15 years	13	21.67
16 - 20 years	4	6.67
More than 20 years	7	11.67

Source: Author's compilation (2024).

4.5. Descriptive Analysis

The study utilised SmartPLS 4 software to conduct descriptive statistical analysis, which helped to uncover the key attributes of the ordinal data. **Table 2** presents the findings of the research, revealing that all the variables yielded mean values clustered around 3, which implies that the respondents were mostly neutral in their responses to the measurement items of all the constructs. Furthermore, the standard deviation is also sufficiently low, indicating a reduced amount of variability in the dataset [39]. Nevertheless, this analysis does not assess causation [40] [44], which informs the study to perform inferential statistics.

Table 2. Descriptive data.

	Mean	Standard Deviation
Funding1	3.417	0.586
Funding2	3.517	0.532
Funding3	3.700	0.493
Funding4	3.533	0.562
Funding5	3.750	0.566
Sales Revenue1	2.817	0.604
Sales Revenue2	3.650	0.601
Sales Revenue3	3.667	0.675

Continued

Sales Revenue4	3.650	0.511
Sales Revenue5	3.817	0.641
Sales Revenue6	3.367	0.552
Sales Revenue7	3.133	0.585
Financial Management1	3.750	0.744
Financial Management2	3.850	0.628
Financial Management3	3.717	0.661
Financial Stability1	2.233	0.663
Financial Stability2	3.050	0.684
Financial Stability3	2.967	0.574

Source: Author's conclusions drawn from the data (2024).

4.6. Normality Test

The study utilised skewness and kurtosis tests in SmartPLS 4 software to evaluate whether the data conformed to a normal distribution. Normality test is important for identifying and addressing any undesirable outliers, which must be dealt with to prevent multicollinearity [45]. Within this particular framework, according to the guidelines set forth by [45] and [44], the data can be considered generally disseminated if their skewness and the kurtosis values are less than 3 in absolute value. As shown in **Table 3**, the skewness and kurtosis standards all lie within the interval of ± 3 , indicating that the data conform to a normal distribution, indicating that the data exhibits a normal distribution. This normality enables the application of structural equation modelling techniques.

Table 3. Normality test.

	Skewness	Kurtosis
Funding1	-0.431	-0.661
Funding2	-0.409	-1.129
Funding3	-0.461	-0.786
Funding4	-0.135	-0.643
Funding5	-1.094	1.763
Sales Revenue1	-0.039	-1.095
Sales Revenue2	-0.607	0.383
Sales Revenue3	-1.470	1.368
Sales Revenue4	-0.256	-1.078
Sales Revenue5	-0.440	0.239
Sales Revenue6	-0.253	-0.506
Sales Revenue7	-0.245	-0.203

Continued

Financial Management1	-0.544	0.337
Financial Management2	-0.702	1.475
Financial Management3	0.037	-0.233
Financial Stability1	0.317	-0.480
Financial Stability2	-0.397	-0.257
Financial Stability3	0.280	0.523

Source: Author's conclusions drawn from the data (2024).

4.7. Factor Loading and Collinearity Tests

This is a crucial technique that serves multiple purposes, including reducing complex data collection instruments into meaningful and relevant factors, verifying the clarity and coherence of categorisation systems, and identifying potential gaps or omissions in the data [46]. This research conducted exploratory factor analysis using SmartPLS 4 software, and the findings are shown in **Table 4**. [46] states that for an item to be selected for analysis, it should have a loading of at least 0.70 on its relevant factor. Alternatively, any items that have a loading of less than 0.70 or cases with cross-loading should be eliminated from the dataset to maintain data integrity, as per [46]'s recommendations. The study commenced by examining the relationships between Financial Management and Financial Stability with three items each, Funding using five items, and Sales Revenue using seven items. However, Funding1, Sales Revenue4, Sales Revenue5, and Sales Revenue6, loaded with values that are less than 0.70, as shown in **Appendix**. In accordance with the guidelines outlined by [40], it is proposed that research omitted the said items from the data. This exclusion was done to guarantee that each of the items exhibited a significant correlation with of at least 0.70, as shown in **Table 4**, in order to fit the analysis.

The study also emphasised the importance of conducting a collinearity test to evaluate the degree of intercorrelation among the model's variables. Using SmartPLS 4 software, the study performed a variance inflation factor (VIF) analysis. A VIF score less than three indicates that the model is capable of effectively capturing variation and is free from multicollinearity, whereas a score exceeding three suggests that the model exhibits multi-collinearity and is limited in its ability to account for variation, as per [40]'s guidelines.

The variance inflation factor values for each construct are all below three as revealed by **Table 4**, signifying a high level of tolerance for variation in the data. The collinearity test outcomes indicate that the model is not compromised by multi-collinearity, thereby ensuring the reliability and accuracy of the results.

Table 4. Factor loading matrix and VIF

	Factor Loading	VIF
Financial Management1	0.901	2.025
Financial Management2	0.808	1.569

Continued

Financial Management3	0.785	1.581
Financial Stability1	0.792	1.336
Financial Stability2	0.880	1.970
Financial Stability3	0.795	1.807
Funding2	0.721	1.713
Funding3	0.812	1.859
Funding4	0.773	1.571
Funding5	0.858	2.017
Sales Revenue1	0.780	1.730
Sales Revenue2	0.740	1.682
Sales Revenue3	0.818	1.740
Sales Revenue7	0.832	1.667

Source: Author's extraction from the analysis (2024).

4.8. Model Fit

A range of widely used indices, including standardised root mean square residuals (SRMR), squared Euclidean distance (d_ ULS), geodesic distance (d_ G), and normed fit index (NFI), were utilised to assess the model's goodness of fit in the study. According to [38] and [41], these indices should meet specific criteria. Specifically, the standardised root mean square residuals, should be less than 0.05 [47] [48], squared Euclidean distance and geodesic distance should not be statistically significant at a 5% level [41], and normed fit index should exceed 0.90 [38]. **Table 5** reveals that all the indices have achieved the desired levels, demonstrating a strong fit between the model and the data.

Table 5. Model fit results

Fit Indices	Suggested	Anticipated	Verdict
SRMR	<0.050	0.012	Accepted
d_ ULS	>0.05	0.083	Accepted
d_ G	>0.05	0.438	Accepted
NFI	>0.90	0.972	Accepted

Source: Author's extraction from the analysis (2024).

4.9. Reliability Test

Cronbach's alpha was used as a measure of reliability in the study to determine the consistency of the scale scores and to assess the internal consistency of the measurement model. A commonly accepted benchmark of 0.7 or higher was applied to determine the model's reliability (as suggested by [40]). Additionally, composite reliability measured by omega-a (rho_a) was also utilised, which should

exceed 0.70 according to [49]. The analysis revealed that the Cronbach's alpha and rho_a value, as presented in **Table 6**, all surpassed the threshold of 0.70, demonstrating that the measures used in the study exhibit strong cohesion and consistency.

Table 6. Reliability results.

	Cronbach's Alpha	Composite Reliability (rho_a)
Financial Management	0.779	0.801
Financial Stability	0.764	0.784
Funding	0.804	0.816
Sales Revenues	0.807	0.832

Source: Author's extraction from the analysis (2024).

4.10. Validity Test

This study evaluated the legitimacy of its measurements by examining equally convergent and discriminant validity. Convergent legitimacy is established when composite reliability surpasses 0.70 then average variance quarried is above 0.50, as recommended by [40]. As revealed in **Table 5** and **Table 6**, the study's outcomes demonstrate that all composite reliability values meet this threshold and average variance extracted (AVE) values are also greater than 0.50, indicating that the measures converge and are reliable indicators of the underlying constructs. Findings for the study demonstrate that it has achieved convergent validity. To ensure discriminant validity, the study applied the Fornell-Lacker criterion and the Heterotrait-monotrait (HTMT) ratio of correlation. According to the Fornell-Lacker criterion, constructs demonstrated discriminant validity when the unique variation explained by each construct was significantly greater than its relationship with other constructs, as proposed by [42]. As shown in **Table 7**, the bolded diagonal values, representing the square roots of average variance extracted, consistently outshine the corresponding correlation values, thereby ensuring that the study has established discriminant validity.

Table 7. Fornell-Lacker criterion.

	AVE	1	2	3	4
Financial Management	0.694	0.833			
Financial Stability	0.677	0.597	0.823		
Funding	0.629	0.595	0.484	0.793	
Sales Revenues	0.629	0.571	0.638	0.446	0.793

Source: Author's extraction from the analysis (2024).

In addition to the Fornell-Lacker criterion, discriminant validity, based on the Heterotrait-monotrait (HTMT) ratio, is attained when the correlation coefficient between concepts is below 0.85 [50]. In reference to the data shown in **Table 8**,

the correlation coefficients for all the variables are lesser than the threshold of 0.85. The findings demonstrate that the study has established discriminant validity between the constructs, as evidenced by the Heterotrait-monotrait ratio, which confirms that the relationships between the constructs are distinct and not overlapping.

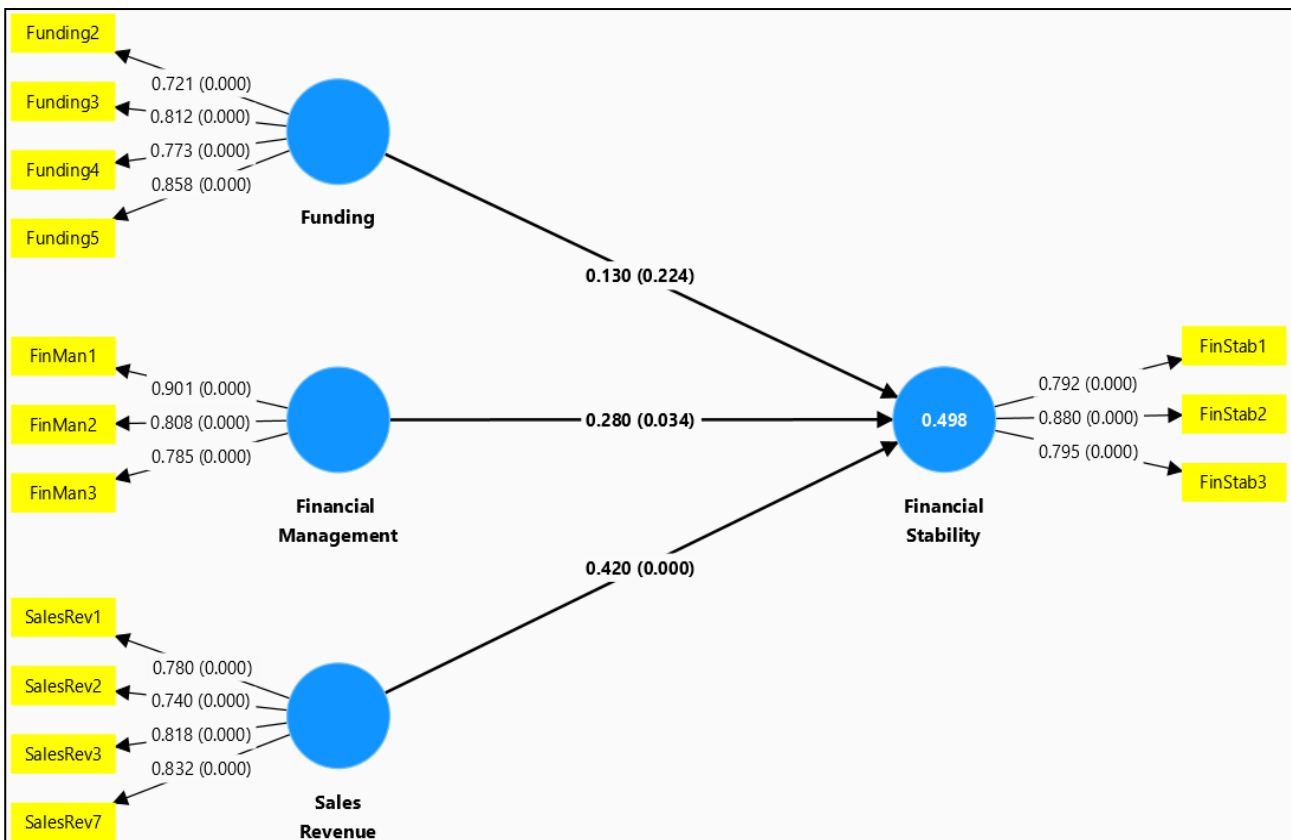
Table 8. Heterotrait-mootrait ratio.

	1	2	3
Financial Management	1		
Financial Stability	0.761	1	
Funding	0.722	0.595	1
Sales Revenues	0.693	0.755	0.536

Source: Author’s conclusions drawn from the data (2024).

4.11. Structural Equation Modelling

Structural equation modelling (SEM) was utilised by the study through the SmartPLS 4 software that investigated the underlying relationships between funding, financial management, sales revenue, and financial stability, with a focus on



Source: Own compilation (2024).

Figure 2. Structural model.

their impact on biodiversity conservation efforts in Namibia. The research utilised 60 cases and the PLS-SEM algorithm option to estimate the structural model. The results depicted in **Figure 2** indicate that funding, financial management, and sales revenue have positive impacts of 0.130, 0.280, and 0.420, respectively, on financial stability of the biodiversity conservation in Namibia. As [49] notes, the impact sizes of 0.02, 0.15, and 0.35 in absolute values represent weak, moderate, and strong influences, respectively, of the latent exogenous variable on the endogenous variable. Based on this framework, the research findings indicate that sales revenue takes significant and solid optimistic impact on financial stability ($\beta = 0.420 > 0.350$), financial management has a reasonable optimistic impact on financial stability ($\beta = 0.280 > 0.150$), whereas funding takes slight optimistic impact on financial stability ($\beta = 0.130 < 0.150$).

To determine the statistical significance of the results, the study conducted a statistical analysis, causal relationships between funding, financial management, sales revenue, and financial stability in Namibia's biodiversity conservation efforts, and the study employed the SmartPLS 4 software with bootstrapping, using 5000 subsamples and 60 cases. The bootstrapping method enabled the calculation of confidence intervals and p-values for standard inference testing, as recommended by [51]. Specifically, the percentile bootstrap confidence interval was used, which is considered the most effective approach [52]. The confidence interval bounds were set at 2.5% and 97.5%. The findings of the hypothesis testing are summarised in **Table 8**. [51] posited that policymakers and managers may consider significant relationships as worthy of attention, whereas relationships lacking statistical significance may be deemed unworthy of such consideration.

5. Discussions

ROI: Impact of funding on financial stability of the biodiversity conservation in Namibia

One of the purposes of this study was to examine the effect of funding on financial viability for biodiversity conservation initiatives. The results, as reported in **Table 8**, indicate that while funding has a small positive effect on financial stability, it is not significant at the 5% confidence level ($\beta = 0.130$; $t = 1.217 < 1.96$; $p = 0.224 > 0.05$; CI $[-0.062, 0.362]$). The results indicate that a 1% increase in funding could lead to a 13% boost in financial stability for biodiversity conservation in Namibia. However, this marginal effect is not substantial enough to warrant managerial attention. Consequently, the study failed to provide evidence to support the first hypothesis (H1) that funding contributes significantly to financial stability.

As emerged from the literature, there exists scanty evidence regarding the impact that funding has on financial stability of the biodiversity conservation. Therefore, by revealing that funding has a positive impact, which is however not significant on financial stability of the biodiversity conservation, the study aimed to fill a practical knowledge gap in the existing literature by addressing an identified

knowledge void, as conceptualised by [11] in his framework for categorising research gaps.

Besides that, the literature underscores the need for bridging biodiversity financing gap through funding [10] [53]-[57]. As such, while institutions such as the European Union and Global Environment Facility have been committed to providing international financial support to enhance biodiversity conservation [53] [56] from the global perspective, it is evident from these findings that it fails to have a material influence on the financial stability of biodiversity conservation in Namibia. Therefore, [53] highlights the need to encourage private investment in nature-based solutions through novel market-based financing mechanisms, such as biodiversity credits, rather than being highly dependent of government funding's and donations. These mechanisms provide a means to overcome the funding imbalance, although they entail certain hazards, such as the possibility of greenwashing and an inequitable distribution of costs and benefits, which signify strict oversights to guarantee that they advance conservation objectives rather than impede them [56].

RO2: The effect of financial management on the financial stability of the biodiversity conservation in Namibia

Additionally, the findings of the study show that well-managed finances have a substantial and statistically significant positive impact on financial stability, thus suggesting that it plays a noticeable and measurable role in maintaining financial stability for biodiversity conservation in Namibia ($\beta = 0.280$; $t = 2.116 > 1.96$; $p = 0.034 < 0.05$; CI $[-0.011, 0.509]$). In brief, a 1% improvement in financial management results in a 28% enhancement in financial stability, according to these findings. The significance of this relationship indicates that this impact is worthy of managerial recommendations. The study thus provides support for Hypothesis 2 (H_2).

In general, these findings are consistent with evidence from prior studies [58]-[60], and these results underscore the significance of effective financial management in ensuring the long-term success of national parks. The findings emphasise the vital importance of financial management in driving national park's overall performance and success. In doing so, it builds on the concept of research gaps by [60] and the study also highlights the importance of financial management in Namibia's conservation efforts, showing that it has a moderate positive and statistically significant influence on the financial well-being of biodiversity conservation initiatives. Therefore, to ensure effective financial management, there is need for accountability and transparency in reporting, which potentially results in increased investment, company's standing, and the confidence of its stakeholders [61]. Furthermore, there is need to harmonise financial management with policy frameworks that bolster biodiversity conservation to guarantee enduring sustainability and congruence with more extensive environmental objectives [62]. Thus, it is essential for organisations to prioritise the prominence of financial management through trainings like financial literacy and other educational means [22] [23]

[25]. When finances of the biodiversity conservation are well managed, it becomes feasible to effectively mitigate threats and deliver conservation outcomes while staying within budget constraints, thereby ensuring that limited financial resources are utilised to maximise conservation benefits [27] [29].

RO3: The influence of sales revenue on the financial stability of the biodiversity conservation

In relation to the influence of sales revenue on the financial stability of the biodiversity conservation, evidence indicates a strong positive and statistically significant influence ($\beta = 0.420$; $t = 4.346 > 1.96$; $p = 0.000 < 0.05$; CI [0.228, 0.615]), as shown in **Table 9**. This indicates that a 1% increase in sales revenue may result in a 43.6% improvement in the financial stability of the biodiversity conservation in Namibia, which is worthy of managerial consideration, given its significance. As a result, the study supports Hypothesis 3 (H_3), as shown in **Table 9**.

Generally, the findings of this study align with the notion of early studies [3] [63]-[66] that recognise the significant influence that sales revenue has on the overall performance of biodiversity conservation. Nonetheless, the literature documents limited empirical evidence with a special reference to the magnitude to which sales revenue influences the financial stability of biodiversity conservation. Hence, by revealing that sales revenue has a strong positive influence relating to the financial security of biodiversity conservation in Namibia, a crucial knowledge gap is filled by the study as suggested by [11], which highlights the lack of research in this area.

Given these findings, [11] details the need for devising strategies and plans, which are essential in attracting more visitors to revisit the parks and boost their wishes to recommend to new visitors, which enhances revenues. In that view, [15] highlights that parks have a huge role to play to ensure positive emotional responses towards a particular destination to maximise tourists' satisfaction and destination loyalty, which is key in maximising sales revenue that drives the financial stability of biodiversity conservations, as emerged from the findings of these study.

Table 9. Hypotheses results.

	Estimate	T-value	p-value	CI = 2.5	CI = 97.5
Funding → FinStab	0.130	1.217	0.224	-0.062	0.362
FinMan → FinStab	0.280	2.116	0.034	-0.011	0.509
SalesRev → FinStab	0.420	4.346	0.000	0.228	0.615

Source: Author's extraction from the analysis (2024).

6. Contributions

This study makes significant contributions to the body of knowledge. Firstly, the study contributes to the literature by documenting the impacts of funding, financial management, and sales revenue on the financial stability of biodiversity

conservation, which is rarely presented by early studies. In brief, the results indicate significant impacts on financial management and sales revenues, which informs the managers of the national parks that these variables are of vital consideration as they pursue financial stability.

7. Recommendations

This section presents the study's conclusions and recommendations, which are grouped into two main categories: functional recommendations and proposals for further research. First, we explore the functional recommendations.

7.1. Functional Recommendations

This section relied on the findings of this study to provide recommendations. These recommendations are of significant contributions to the practitioners, precisely the management personnel of the national parks, as well as the policymakers in ensuring the financial stability of biodiversity conservations. In so doing, the study recommends the following:

Firstly, quantitative evidence reveals that both financial management and sales revenue correspondingly have moderate and strong positive impacts on financial stability, which are proven to be statistically significant, while the positive impact of funding is not significant.

Secondly, a study should be done to conduct a comparative analysis of sustainable financing models for biodiversity conservation in national parks across different countries to identify common trends, challenges, and best practices.

Finally, the study relied on the combined findings from the quantitative aspects and developed a model for sustainable financing of biodiversity conservations when qualitative aspects are studied. Hence, the study recommends that the management of national parks adopt the developed model to ensure the sustainable financing of biodiversity conservation.

7.2. Suggestions for Future Study

The study recommends exploring additional variables in future research. Furthermore, considering that the current study revealed a one-way relationship between sustainable finance and park funding, it is suggested that funding for park operations and development be made more targeted in order to better understand the specific impact of funding on biodiversity conservation. Similarly, future research could also focus on the funding of public expenditure and tourism funding, as well as general government funding, to further improve policy recommendations. Finally, further research is suggested to improve the data once they become available.

8. Conclusion

The article concludes that government grants and subsidies form the bedrock of financial stability, diversified funding sources such as tourism revenue, philanthropic

contributions, and corporate partnerships are crucial for flexibility and resilience. Strategic financial planning, efficient resource allocation, and strong stakeholder engagement are essential in providing this evidence. By ensuring optimal allocation and use of resources, robust financial controls, and strategic planning, parks can achieve sustained financial health and resilience. Proper financial management not only secures the necessary funds for current conservation projects, but also builds a foundation for long-term ecological preservation and sustainability. Adopting best practices in financial management, enhancing capacity, and fostering transparent stakeholder relations significantly bolster conservation efforts and ensure the protection of biodiversity in national parks for future generations. The study further concluded that sales revenue plays a significant role in the financial stability of biodiversity conservation in national parks. While it offers a crucial funding source that can enhance conservation efforts and operational resilience, reliance solely on such revenue poses several risks. Parks must adopt a diversified and strategically managed approach to revenue generation, ensuring that financial stability supports and does not compromise conservation objectives. Effective integration of sales-driven activities with biodiversity goals, along with robust financial planning and community engagement, can enhance the sustainability and impact of conservation efforts in national parks.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix: Initial Factor Loading Matrix

Factor Loading	
FinMan1	0.901
FinMan2	0.808
FinMan3	0.785
FinStab1	0.788
FinStab2	0.879
FinStab3	0.801
Funding1	0.695
Funding2	0.731
Funding3	0.795
Funding4	0.739
Funding5	0.841
SalesRev1	0.734
SalesRev2	0.715
SalesRev3	0.775
SalesRev4	0.579
SalesRev5	0.589
SalesRev6	0.664
SalesRev7	0.819
