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Papers

An Assessment of the Contributions of Ecosystem Services in Guinea-Bissau: A Case Study of Cantanhez National Park

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Abstract
Valuation of ecosystem services (ES) is vital for national growth and development, particularly in Guinea-Bissau which is ranked among the poorest nations worldwide. Therefore, this study assessed the contributions of five ES (land, sea, medicinal plant, mangrove and tourism) in the Cantanhez National Park with a view to establishing their effects on the growth and development of Guinea-Bissau. Data were purposively obtained through semi-directed interviews and questionnaires from 226 respondents in Tombali. A multi-stage sampling method was employed in this study. At the primary stage, the purposive sampling technique was used to select 11 villages closely situated 3-4km apart within Cantanhez Park while at the secondary stage, a second stage of purposive sampling was employed in the selection of 20 individuals in each village and at the final stage, face-to-face interviews were conducted to establish the robustness of our results. The study adopted the Contingent Valuation Method to elicit information from respondents, while data were subjected to descriptive statistics. The study revealed that people were willing to pay between 1 and 25000 FCFA for the ES, an average of about 12,500 FCFA based on the income of respondents. This value was used to project the additional income and per capita income that could be generated annually from the five ES. These were approximately 5.07 billion FCFA and 2574.09 FCFA respectively. The result showed that ES observed in this study could contribute to the growth and development of Guinea Bissau; and to ensure maximal contribution, successful implementation of the conservatory and regulatory policies is requisite. The study concludes that periodic ecological valuation of ES is essential for inclusive growth and sustainable development.

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INTRODUCTION

Ecosystem services are the socioeconomic and ecological benefits provided by nature to ensure human welfare. (Kubo *et al.*, 2021; Niemandt; Greve., 2016). However, ecosystems are naturally affected by anthropogenic activities and climate change, leading to a degradation of the biodiversity. This necessitates the valuation of ecosystem services (ES) to ensure the conservation and sustainability of natural resources (Ronchi, 2021). Equally, the monetary assessment of ES is a viable determinant of a buoyant economy, successful governmental policies, and an estimator of a country's GDP (Boyd, 2012; Nijnik; Miller., 2017). Moreover, economic valuation of natural resources reveals their significant contributions to human welfare; this will consequently allow for policy development and prioritisation to ensure maximum benefits (Selivanov; Hlaváčková., 2021). Following this, it is apropos to adopt an integrated and horizontal methodology, in addition to considering the regulatory policies, the state of the goods, the environment and the consumers' demographics to ensure accurate ecological valuation (Krivačić; Jankovic, 2017; Koko *et al.*, 2021; Schild *et al.*, 2018; Selivanov ;Hlaváčková, 2021; Chan ;Satterfield, 2020). For instance, contingent valuation method (CVM) is a stated preference survey approach that has been widely utilised to ascertain the socioeconomic benefits of ES to ensure cogent policy development (Chen *et al.*, 2019; Perni *et al.*, 2021; Selivanov; Hlaváčková, 2021). Besides creating consistent information, CVM allows the integration of data from many sources, consequently providing the opportunity for informed decision-making to ensure sustainable economic development (Vardon *et al.*, 2018; Perni *et al.*, 2021).

However, despite the diversity of natural resources in Guinea-Bissau, it is confronted with severe socioeconomic development as a result of environmental challenges, consequently resulting in extreme poverty (Sousa *et al.*, 2017; World Bank, 2023; Palmeirim *et al.*, 2023). The conservation of environmental quality has been neglected for decades, and public awareness about the preservation of the environment is very poor (Palmeirim *et al.*, 2023). Subsequently, anthropogenic activities and climate change affect the desired level of biodiversity, leading to the creation of policies and laws for environmental protection (FAO, 2021; Temudo; Cabral 2017). However, the implementation of the public policies has not been successful because the country has not really comprehended the quality of the natural resources, and the significance of their monetary valuation which is one of the determinant factors in the ability to preserve and value ES (Selivanov; Hlaváčková, 2021; Temudo; Cabral, 2017; Intchama *et al.*, 2018; World Bank, 2019). Therefore, industries are more focused on growth at the expense of environmental sustainability that can provide a long-term economic value of the environment and natural resources (Temudo; Cabral, 2017; Chung; Cho, 2018). Consequently, Guinea-Bissau has not been able to benefit from environmental goods (World Bank, 2019; FAO, 2012; Michiel *et al.*, 2020).

Therefore, to promote economic and environmental regulation, advantageous activities, trade-offs, and optimum course of action, it is crucial that the nation, particularly the policymakers take advantage of the benefits of monetary valuation of ecosystem services (Sajise *et al.*, 2021; Selivanov ;Hlaváčková, 2021). Monetisation will make visible the significant contributions of ecosystem services to human welfare in Guinea-Bissau, as well as reveal the people's preferences, and reasons for their choices. These in turn will positively help the country to monitor, preserve and promote the nonmarket goods to ensure socioeconomic growth and development (Boyd, 2012; Sajise *et al.*, 2021). Therefore, this study utilises CVM to evaluate the contribution of ES to growth and development in Guinea-Bissau, with a view to estimating the value of the natural resources, taking into cognisance the impact of the national policies on these services.

THE CONTINGENT VALUATION METHOD (CVM)

Contingent valuation method is an economic approach for assessing the monetary value of environmental goods (Mitchell; Carson, 1989; Perni *et al.*, 2021; Sajise *et al.*, 2021). The method allows the estimation of the value individuals are willing to pay (WTP) for a particular service or willingness to accept (WTA) to forgo a service. Given this, individuals are asked to explicitly declare their WTP or WTA to forgo a good, hence CVM is a prominent stated preference technique that enables informed decision-making (Selivanov; Hlaváčková, 2021; Sajise *et al.*, 2021;

Mitchell; Carson, 1989). Nevertheless, CVM is not without its limitations which this study has addressed to ensure consistent, valid, and reliable results. In essence, this study overcomes the major limitations of CVM. The limitations of difficulty in *valuing specific complex goods* and *information bias* are overcome by adopting the generic method of valuing goods to avoid the claim of lack of knowledge of specific goods. This means once a respondent is using any good in any of the generic ecosystem services highlighted in this study; then the bid for the WTP applies to him. Furthermore, all 226 questionnaires were 100 percent responded to thereby overcoming non-response bias. Finally, the minimum mean value adopted handles the hypothetical bias of overstating or understating true WTP. Moreover, the information on the income of respondents helped to overcome this bias, as data observation revealed that respondents selected WTP based on their income.

Accordingly, contingent valuation questionnaire is purposely structured to elicit each respondent's preference in monetary values for the ES being valued. WTP is the maximum amount a person is willing to pay for a good while WTA is the minimum amount a person or a community is willing to accept as compensation if there is environmental degradation or deterioration in environmental quality. The survey questionnaire also includes elicitation of respondents' attitudes regarding the ES to be appraised, and their demographic features (Sajise *et al*., 2021; Perni *et al*., 2021). WTP or WTA is dependent on the following factors: the first and last levels of the good in question (q0 and q1); the respondent's income and all the prices of the goods/services, including substitute goods or activities. Internal validity of WTP responses may be tested by regressing WTP on the first and last factors and demonstrating that WTP correlates with socioeconomic variables in predictable ways (Selivanov; Hlaváčková, 2021; Sajise *et al*., 2021).

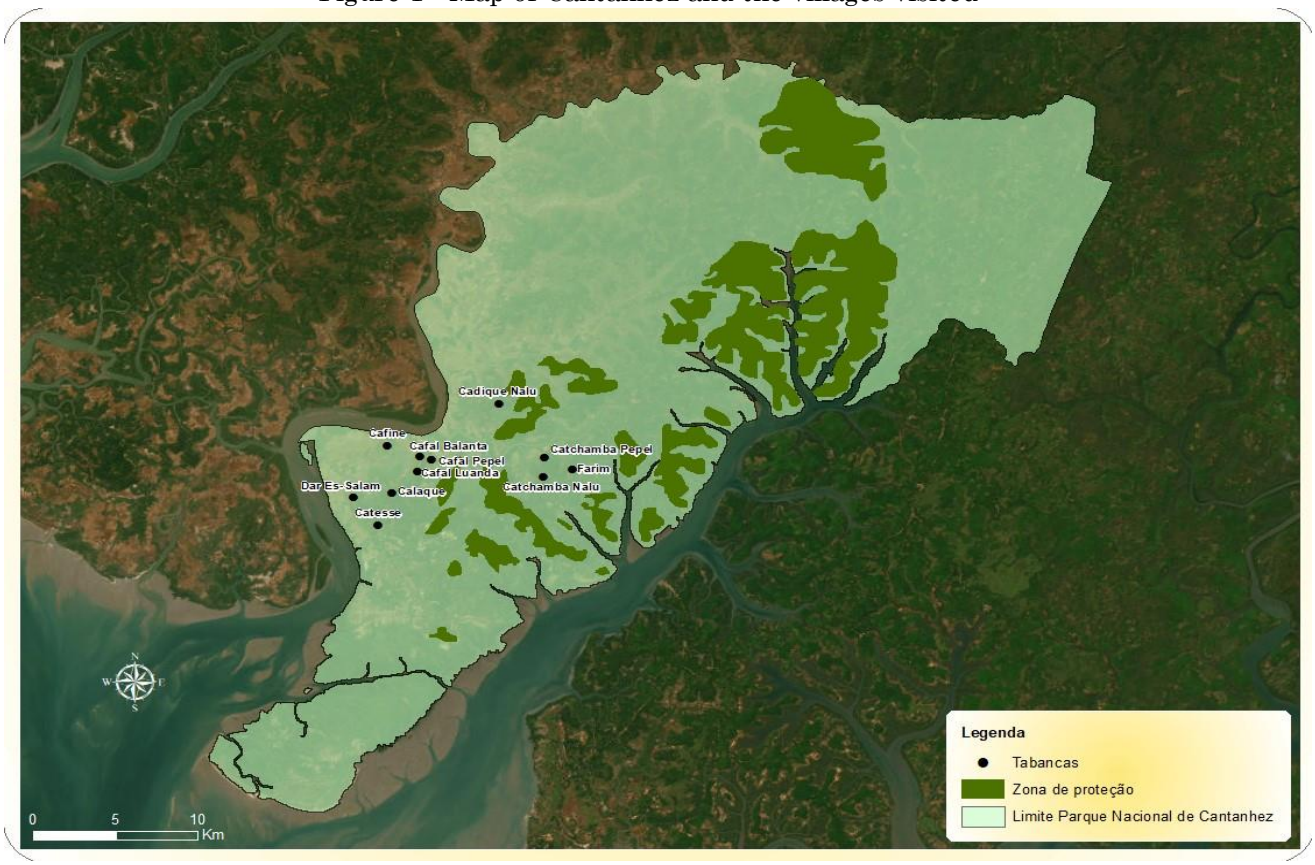
MATERIALS AND METHODS

Study area

The study site is Cantanhez National Park (CNP), a cosmopolitan environment comprising of rural population across one local government. It is located at the southwestern part of Guinea-Bissau which coincides with the Bedanda Sector of the Tombali Region. CNP also covers portions of the Quebo and Cacine Sectors, a territory with a surface area of 1067.67 Km2, which has natural boundaries, the Cacine estuary and the Atlantic Ocean to the east, the Balana River to the north and the Cumbijã River to the west. It became a national park via Decree No. 14/2011 in 2008 to preserve its rich biodiversity to ensure sustainable development and the promotion of eco-tourism (FAO, 2012; Sousa *et al*., 2017). It is a forested park, with mangroves and savannahs (Temudo, 2012; Sousa *et al*., 2017; Pereira *et al*., 2022).

The main objective of CNP is the preservation of the environment, and the promotion of all the activities that can improve the living conditions of the local populations (Abreu, 2011). Accordingly, natural resources are fundamental for the conservation of the forest and the survival of local populations, not only from an economic and ecological point of view, but also culturally and historically (Cramez *et al*., 2021). However, its biodiversity and ecology have been greatly affected by anthropogenic pressure, though the park is one of the most important wetlands in Guinea-Bissau, (Oliveira; Silva, 2010; Cramez *et al*., 2021). Therefore, the task of preserving nature has become a mandatory requirement for local development and a practical way of ensuring this, is subjecting the natural resources to monetary valuation. Below, the maps of Guinea-Bissau and Cantanhez National Park are shown in Figure 1.

Figure 1 - Map of Cantanhez and the villages visited



Source: IBAP (2022). Elaborated by the Authors (2022).

Study design

The study adopted both the qualitative and quantitative contingent valuation method to capture respondents' perceptions and to enable the discovery of their subjective meanings. A contingent valuation questionnaire was formulated to elicit information from the respondents to capture individual preferences: the willingness to pay (WTP) for the ES and the willingness to accept (WTA) to forgo the services. Willingness to Pay indicates the maximum amount a person would be willing to pay for the use of each ecosystem service presented, or to avoid the deterioration of an environmental resource. This has been found to be the most appropriate way to value changes in availability for nonmarket goods, and it is the most commonly adopted format (Chen *et al.*, 2019; Perni *et al.*, 2021). In order to avoid making the questions too complex for the interviewees, which could make them difficult to understand and make the result very dependent on how they were asked, it was necessary that the information be clearly presented to the respondents, so that the result of the study would not become inconsistent. Thus, the questions were clearly structured to elicit information regarding their attitudinal and behavioural stances with respect to the value of each ES. Since most of the respondents were illiterate the use of technical terms and words outside everyday use was avoided. To obtain reliable results and avoid overestimating the WTP, a conservative planning where all relevant information was provided was utilised. Likewise, face-to-face interview was conducted to motivate subjective response. The method also inhibited unanswered questionnaires, aside deterring the interviewers from influencing the results. The interviewers were equally trained not to interfere in the interviews by not providing their personal opinion, or any other type of information that could influence the answers of the respondents.

Sampling techniques

A multi-stage sampling method was employed in this study, given its advantages of increased efficiency, improved representation and reduced

sampling error. At the primary stage, the purposive sampling technique was used to select 11 villages closely situated around Cantanhez Park in Tombali region while at the secondary stage, a second stage of purposive sampling was employed in the selection of 20 individuals in each village, making 226 respondents. The final stage continued as the face-to-face interviews with individuals, including the community heads to establish the robustness of our results. We defined the research population by identifying the group of individuals relevant to our study's focus. For instance, we identified people from these 11 villages, males and females aged 18 and above, residents in the different villages for at least six months, inside the Cantanhez Park. We equally followed additional inclusion criteria, such as villages located within 3 to 4km apart with population size between 500-1,000 inhabitants with diverse socioeconomic backgrounds and willingness to participate in the study. In precis, we took into consideration the factors that are related to religion, economic status, gender and age.

Unstructured questionnaire was administered to the respondents which comprised students, civil servants, spiritual leaders, trade groups, and community leaders. For the qualitative approach, face-to-face interviews were conducted with 2 key informants from each group. The researcher obtained permission from all the respondents to conduct in-depth interviews, while permission was also granted to record interviews on tape recorder. Finally, a focus group discussion consisting of six people, the village heads inclusive, was conducted twice with different categories of people to ascertain if they understood the monetary valuation of ES. The quantitative analysis was carried out using simple descriptive statistics.

RESULTS AND DISCUSSIONS

Respondents' demographic features

Eleven villages were purposely selected in Tombali region because of their proximity to CNP, their activities and the ES subjected to monetary evaluation. Congruently, farming and fishing are the major economic activities of the people. Twenty respondents were purposively selected from each village, but with the exception of four, which consequently totalled 226 respondents. Table 1 below displays the demographic features of the respondents. The number of males was greater than the females which probably accounted for a greater number of literates among the males. 58 (43.94%) were literates while the number of educated females was 24 (25.53%). Seventy (74.47%) were uneducated among the females while 74 (56.06%) were illiterates amongst the male respondents. Likewise, the highest number of answers was recorded amongst those between the ages of 31 and 40 followed by those between 41 and 50 years old. The lowest response was observed amongst those between 51 and 60, and >60.

Table 1 - Summary of respondents' demographic features.

Variable	Frequency			Percentage Distribution
Gender				
Male	132			58.41
Female	94			41.59
Total	226			100
Age category				
18-30	46			20.35
31-40	82			36.28
41-50	80			35.40
51-60	10			4.42
>60	8			3.53
Total	226			100
Household				
2	1			0.44
3	1			0.88
4	1			1.33
6	6			3.98
7	8			3.54
8	16			7.08
9	23			10.18
>10	170			75.22
Total	226			100
Villages	**Sample**	**Male**	**Female**	**Percentage Distribution**
Cadique Nalu	20	7	13	8.85
Cafal Balanta	20	9	11	8.85
Cafal Luanda	22	11	11	9.73
Cafal Pepel	20	15	5	8.85
Cafine	21	14	7	9.29
Calaque	20	11	9	8.85
Catchamba Nalu	20	14	6	8.85
Catchamba Pepel	20	9	11	8.85
Catesse	22	16	6	9.73
Dar Es Salam	21	15	6	9.29
Farim	20	11	9	8.85
Total	**226**	**132**	**94**	**100**
Literacy				
Literate	82			36.28
Illiterate	144			63.72
Total	226			100

Source: The Authors (2022).

Main ecosystem services in Cantanhez National Park (CNP)

Ecosystem services play a crucial role in human welfare, likewise in Guinea Bissau (Koko *et al.*, 2021). Since, the country depends on the availability of these nonmarket services for survival, it is apropos that the natural resources should be well managed to ensure that they yield their values in natural capital (Anderson, 2019; Koko *et al.*, 2021). Accordingly, ecological valuation is a practical and productive means of ensuring the preservation of natural resources to ensure maximal productivity, as ES are valued based on the human welfare they provide (Holzman, 2012; Palmeirim *et al.*, 2023). This evaluation is particularly significant in the study site where the main economic activities are farming and fishing (Pereira *et al.*, 2022; FAO, 2012; Temudo; Cabral, 2017). Subsequently, the ES subjected to ecological valuation is taken in turn.

Land services

Guinea-Bissau is located at the crossroads of two biomes: The Guinea-Bissau woods, which cover the northern part of the country, and the savannahs, located between the forests and the Sahara Desert in West Africa (Catarino *et al.*, 2016; Intchama *et al.*, 2018). Agriculture is the dominant economic activity, and it contributes over 50% of GDP, over 80% of exports, besides employing about 85% of the working population. The main commercial product is cashew nuts, accounting for about 93% of the country's export revenues (Pereira *et al.*, 2022; Temudo; Abrantes, 2014). Livestock products represent about 17% of the national GDP and 32% of the agricultural GDP. The country has natural conditions favourable to the cultivation of various agricultural products.

The investigation showed that the majority of the population are peasants and are consequently subsistence farmers, which evinced the significance of agriculture as a means of livelihood in the study area. Thus, each family possesses a small field, generally less than 4 ha, mostly occupied by cashew plantations in the high zones (Pereira *et al.*, 2022; Sousa *et al.*, 2017). With the exception of cashew, production is on a small scale and is intended for family consumption. The crops that have greater importance at the CNP level, whether economically or for their impacts on diet and food security are rice, cashew nuts, groundnuts, beans, cassava, and yam. However, only cashew and groundnut have commercial and economic value, hence, both are the main sources of household income (Lundy, 2012). In spite of the importance of the agricultural sector in the local diet, its practice constitutes a major threat to the park as a result of deforestation, leading to a progressive degradation of the vegetation cover (Sousa *et al.*, 2017; Temudo; Abrantes, 2014). Consequently, the forest is gradually progressing from savannah to herbaceous and large cashew fields (Palmeirim *et al.* 2023; Pereira *et al.*, 2022).

A significant number of the respondents affirmed that land was vital to their existence, which accounted for their willingness to pay for its service (Temudo; Abrantes 2014; Cramez *et al.*, 2021; Holzman, 2012). Those who refused to pay their dues disclosed that they were not satisfied with the measures implemented to protect the park. Their refusal evidenced the unsuccessful implementation of Environmental Framework Law and Protected Areas Act (Government of Guinea-Bissau, 2019) (unpublished data); (Temudo; Cabral, 2017; Intchama *et al.*, 2018; Sousa *et al.*, 2017). Below is Table 2, and it presents the abstract of the results on land service.

Table 2 - Summary of monetary values for land service

Land services	Frequency	Percentage
Willingness to pay		
Positive	200	88.50
Negative	26	11.50
Reason to Pay for Agriculture		
Contribute to a good cause	136	62.39
The program is worth this amount	46	21.1
I feel we must protect this forest	3	1.38
To pay my share of the contribution	2	0.92
Other Reasons	13	5.74
Willingness to pay		
1 FCFA - 25000 FCFA	195	**86.28**
26000 FCFA - 50000 FCFA	4	1.77
250000 FCFA - > 300000 FCFA	1	0.44
Available respondents	200	88.50
Unavailable respondents	26	11.50

Source: The Authors (2022).

Sea services

The fisheries sector in Guinea-Bissau is considered a strategic sector for the diversification of the national economy, and specifically earmarked to fight poverty, ensure food security and nutrition for the country's population (FAO, 2012; Intchama *et al.*, 2018; Cross, 2015). Correspondingly, the artisanal fishery sector has employed over 255,000 of the population, and about 5,600 unskilled fishers (Intchama *et al.*, 2018; China Dialogue Ocean, 2023). Fishing is the second source of foreign currency in Guinea-Bissau. Despite the sector's economic potential, Guinea-Bissau is still in the category of the poorest countries in the world (World Food Programme, 2023). The 2018 United Nations Development Index ranked the country 177th amongst 188 countries in the world (World Bank, 2019). According to the World Food Programme (2023), 64.4% of the population lives in poverty, while 68% cannot afford a healthy diet. Congruently, the fisheries sector's contribution to tax revenue, foreign exchange earnings, employment and income is below its potential (Intchama *et al.*, 2018; Cross, 2015) These shortcomings are have been attributed to the incessant acts of illegal, unrecorded and uncontrolled fishing in Guinea-Bissau. These underscored the unsuccessful implementation of the laws regulating public participation, environmental protection, social impacts, and license acts (Intchama *et al.*, 2018; China Dialogue Ocean, 2023; African Defence Forum, 2023; Cross, 2015). Subsequently, the results underpin the significance of carrying out a recurrent monetary valuation of ecosystem services because it is the only viable channel that enables the comparison of the net social benefits related to public policies and participations, and activities (Boyd, 2012; Vardon *et al.*, 2018; Sajise *et al.*, 2021).

Furthermore, the results equally evinced that it is necessary to acquaint the locals with the needful scientific knowledge on fishing in the Cantanhez Forest because most of them are illiterates (World Bank, 2023a). Additionally, the improved scientific knowledge will enable the integration of all measures of local development and biodiversity protection. Likewise, the responses of the respondents evidenced the need to give priority to resident fishermen to access the service because it is a lucrative diversification from land service that can positively impact household and national incomes (Intchama, *et al.*, 2018; Cross, 2015). The co-management of fish resources will promote the protection of habitats for reproduction and reduce the impact of climate change on marine ecosystems (Intchama *et al.*, 2018; Cross, 2015).

The result also depicted that most of the respondents were not willing to pay for sea service because of the public participation processes involved as enacted in the Public Participation Policy (Law No. 5/2017), as well as the need to collect environmental licenses which they can barely afford owning to the extreme poverty rate

in the country (Cross, 2015; Inchaman *et al.*, 2018). Consequently, to avoid the penalties for violation, may have also contributed to the respondents' unwillingness to pay for sea service. The respondents' unwillingness implied that the contribution of fishing to the welfare of the household economy is below its expected potential as the quality and quantity of fish have reduced owing to illegal fishing by foreigners (Inchaman *et al.*, 2018; Temudo, 2012; China Dialogue Ocean, 2023; African Defense Forum, 2023). Subsequently, it is necessary that the regulatory policies regarding the protection of the Cantanhez National Park be well implemented. Additionally, the socioeconomic status of the people should be taken into consideration by policy makers to boost sea service (Failler *et al.*, 2019; Schild *et al.*, 2018). Moreover, the climatic, political and economic situations in Guinea-Bissau are disadvantageous to the lucrativeness of fishing in the study area (Temudo, 2012; Cross, 2015; World Bank, 2019). Table 3 presents the statistical summary of the results.

Table 3 - Summary of monetary values for sea service

Sea Services	Frequency	Percentage
Willingness to pay		
Positive answer	108	47.47
Negative Answer	118	52.2
Reasons to pay		
Contribute for a good cause	85	37.61
This programme is worth this amount	18	7.96
I feel we must protect the forest	3	1.33
To pay my share of contribution	0	0
Other reasons	2	0.88
Amount willing to pay		
1 FCFA - 25000 FCFA	**105**	46.46
26000 FCFA - 50000 FCFA	2	0.88
250000 FCFA - > 300000 FCFA	1	0.44
Available respondents	108	47.79
Unavailable respondents	118	52.21

Source: The Authors (2022).

Medicinal plants

The result indicated that traditional medicines are of great importance, especially in situations where conventional medicine is not accessible, hence it plays a significant role in the welfare of the communities. (Catarino *et al.*, 2016: Sambu *et al.*, 2023). Congruently, medicinal plants are used by healers to stop certain symptoms and illnesses, save lives and prevent serious complications. However, they are mostly patronised by those lacking the financial means to seek conventional health care (Frazão-Moreira, 2016; Catarino *et al.*, 2016). Most medicines are obtained from the roots, stems and leaves, sap, and seeds of plants; they are generally grounded, crushed, dried, or made into syrup (Sambu *et al.*, 2023). Medicinal plants have economic potential, as the examination depicted that through this profession the healers have managed to create wealth, thus developing the family economy. Healers could be paid in agricultural products such as rice, corn, beans, chickens, goats, and sheep, including drinks such as brandy and palm wine, as well as in cash. However, the payment modalities depend on the gravity of the illness and the prerogative of the healers (Catarino *et al.*, 2016; Sambu *et al.*, 2023). Table 4 below articulates the main medicinal plants in CNP.

Table 4 - The main medicinal plants in CNP

Species (Scientific Name)	Vernacular Name	Parts Used	Treatment
Pterocarpus erinaceus	Po di Sangue	Bark (Cabacu	Anemia
Anthocleista procera	*Ceaboupa matchu*	Leaves and roots	Postpartum
Elaeis guineensis	*Palmeira*	Palm oil and roots	Yellow fever and toothache
Parkia biglobosa	*Foroba*	Fruit and seed	Yellow fever, high blood pressure and malaria
Cassia sieberiana	*Canafistra*	Roots	Tiredness and parasites
Khaya senegalensis	*Bissilon*	Bark (Cabacu)	Belley ache, anaemia and intestinal cleansing
Landolphia heudelotii	*Folesinho*	Fruit	Malaria
Sarcocephalus latifolius	*Madronha*	Roots	Belly ache (new born)
Xylopia aethiopica	*Malagueta preto*	Seeds	Colic and blood cleansing
Adansonia digitata	*Ceabecera*	Fruit	Diabetes
Saba sengalenses	*Fole-ligante*	Fruit	Malaria

Source: The Authors (2022).

The marketing of herbal remedies has become a lucrative occupation for healers in major cities, especially Bissau, and across the border, such as in Guinea, adding up to significant sums of money. For example, a flour-based remedy in a small bottle of mayonnaise costs 1,500 FCFA and the roots in a 1.5-liter bottle cost 1,000 FCFA. This indicates that the average annual income for each healer from the commercialisation of medicinal plants is estimated at between 200,000 FCFA and 300,000 FCFA. The results showed that medicinal plant plays an important role in the lives of the local population, as a good source of household income and a resourceful welfare for the wellbeing of the population. However, the results indicated that the local population did not perceive medicinal plants as an ecosystem service, because they perceived it as a religious ritual, aside considering themselves experienced healers (Frazão-Moreira, 2016). This accounted for the low response on their willingness to pay for the service. The responses of the respondents suggested that they did not regard medicinal plants as ecosystem services that needed to be well managed to ensure optimum benefit. The reason could be attributed partly to the fact that most of the people are not educated, and their religious beliefs (Frazão-Moreira, 2016; FAO, 2012). Nonetheless, a minute percentage of the respondents interviewed, who were healers, perceived medicinal plants as an avenue that could be profitable for individual households and the community (Sambu *et al.*, 2023). Thus, Table 5 communicates the summary of the results.

Table 5 - Summary of monetary values for medicinal plants

Variables	Frequency	Percentage
Willingness to pay		
Positive answers	82	36.8
Negative answers	144	63.72
Amount willing to pay		
1 FCFA - 25000 FCFA	79	33.63
26000 FCFA - 50000 FCFA	2	1.33
250000 FCFA - > 300000 FCFA	0	0.00
Available respondents	82	36.28
Unavailable respondents	144	63.72

Source: The Authors (2022).

Mangrove services

Guinea-Bissau is the second largest country in West Africa that produces mangroves. It is an important livelihood resource and a valuable biodiversity asset; thus it is an ecosystem of enormous importance for coastal protection, food security and the conservation of biodiversity (Andreetta *et al.*, 2016; Temudo; Cabral, 2017). One of the factors that contributed to the production of mangroves was a fall in the production of brown rice in the late 90s. Though mangroves also provide numerous maintenance and regulatory services, especially as a vital ecosystem carbon storage, yet it faces global threats such as degradation, pollution, extreme exploitation and replacement by aquaculture (Andreetta *et al.*, 2016; Temudo; Cabral, 2017). However, despite the contribution of mangroves service to the people's welfare, a significant number of the respondents were not willing to pay for its services. Some of the services are the provision of food and wood, in addition to regulating climate change, thus checking coastal erosion (Andreetta *et al.*, 2016; Temudo; Cabral, 2017). Their unwillingness may be ascribed to the fact that most of the farmers are now utilising most of its space for the cultivation of rice and cashew, and the failure of the NGOs who partnered with the political and local administrators to provide financial support for its production (Temudo, 2012; Temudo; Abrantes, 2014; Sousa *et al.*, 2017; Pereira *et al.*, 2022). Subsequently, the communities were confused and indignant. The result evidenced the unsuccessful implementation of public policies on environmental funding and preservation of ecosystems in protected areas, consequently calling into question their cogency and reliability (Government of Guinea-Bissau, 2019; Atkinson and Mourato, 2008). Table 6 enunciates the precis of the findings.

Table 6 - Summary of monetary values for mangrove services

Variables	Frequency	Percentage
Willingness to pay		
Positive answers	70	30.97
Negative answers	156	69.03
Amount willing to pay		
1 FCFA - 25000 FCFA	67	29.65
26000 FCFA - 50000 FCFA	3	1.33
250000 FCFA - > 300000 FCFA	0	0.00
Reason to pay		
Contribute to a good cause	57	25.22
This service worth this amount	6	2.65
I feel we must protect the forest	3	1.30
to pay my share of contribution	1	0.44
others reasons	3	1.30

Source: The Authors (2022).

Tourism service

Tourism service is a potential resource for socioeconomic, socioecological, and cultural development in Guinea-Bissau; it is a functional channel of diversification for the country's economy (Abreu, 2011; Cramez *et al.*, 2021). In recognition of its potential for local and national growth, it is germane that tourism services be properly managed to ensure maximum productivity (Andries *et al.*, 2021; Abreu, 2011). For instance, Cantanhez forest is the first area of the Portuguese colonial liberation war in Guinea-Bissau, with the oldest local militia base in the country, in terms of natural beauty, it has a natural park with the largest continuous concentration of main ecosystem services, which can be considered in the development of the country. The forest shelters fauna rich in crocodiles, hippos, otters, monkeys, as well as many species of migratory birds (Abreu, 2011). Consequently, it is important that government's effort be geared toward its management. Conservationists should be committed to the environment, to social responsibility and to local development, with a view to generating

employment and income. Accordingly, there would be an improvement in the quality of life of the residents. The results of the research pointed to problems in basic infrastructure, mainly in the areas of transport, communications, unavailability of health facilities, search and rescue teams (Abreu, 2011). Thus, CNP, when compared to the developments in the neighbouring Sectors of Quebo and Cacine, is at a disadvantage as a result of structural challenges (Oliveira; Silva, 2010).

However, despite the structural challenges, the result showed that the respondents were interested in tourism service, as a significant percentage submitted positive responses. This implies that the service contributes to the socioeconomic welfare of the villagers (Pisani *et al.*, 2022; Anderson, 2019). The response of the respondents suggests that tourism is a functional contribution to growth and development in Guinea-Bissau (Sajise *et al.*, 2021; Boyd, 2012). The statistical analysis is shown in Table 7.

Table 7 - Summary of monetary values for tourism services

Variables	Frequency	Percentage
Willingness to pay		
Positive answers	200	88.50
Negative answers	26	11.50
Amount willing to pay		
1 FCFA - 25000 FCFA	195	86.26
26000 FCFA - 50000 FCFA	4	1.77
250000 FCFA - > 300000 FCFA	1	0.44
Available respondents	200	88.50
Unavailable respondents	26	11.50
Reason to pay		
Contribute to a good cause	143	63,27
This service is worth this amount	40	17,7
I feel we must protect the forest	4	1.77
To pay my shrae of contribution	2	0.88

Source: The Authors (2022).

Cross-referencing results

This section presents a cross-referencing of the results obtained to demonstrate cohesiveness and the interrelationships. These relationships are presented in the following tables. Table 8 articulates a cross data between willingness to pay and willingness to accept, as well as listing the analysed ecological services. Most of the respondents were willing to pay for land and tourism services because agriculture is the dominant economic activity in Guinea-Bissau, generating over 90% of export earnings (See 4.2.1; 4.2.5). Likewise, there are notable tourist attractions in the country (e.g., CNP and Bijagos Island), which subsequently led to an influx of thousands of tourists into the country. In 2017 Guinea-Bissau realised about 20 million USD in tourism (Cramez *et al.*, 2021). This income was used to build hotels, hospitals and road construction, leading to job creation for the populace, and a consequent improvement in the people's standard of living. This must have also accounted for the respondent's willingness to pay for the service. Consequently, tourism has become a source of economic progress for communities and the government. This implied that ES are valued based on the extent of the human welfare they give (Holzman, 2012; Koko *et al.*, 2021) The respondents were equally willing to pay for sea services because fishing is the second major occupation in Guinea-Bissau (Temudo; Cabral, 2017). The services presented in the table except for the tourist service, showed that respondents preferred to pay the least possible amount. This probably indicates that the socioeconomic benefits from the tourist service transcend the other ecosystem services, or because most of the tourist centres have cultural and historical values that the respondents deemed fit to preserve (Cramez *et al.*, 2021). Equally, the fact that most of the respondents were only willing to pay 25000 fcfa

affirmed the poverty level of the country, as it has been rated one of the ten poorest countries in the world (World Bank, 2024). Table 9 is a presentation of the general summation of the people surveyed. While both sexes demonstrated the willingness to pay for the ecosystem services and the suggested amount, however, the male respondents accepted to pay a higher amount than the female. This could be attributed to the policy of contribution among women in the area. This signified that if the programme were implemented for the development of the local community, the men would be willing to pay a high value for each ecosystem service than the females.

Table 8 - Crossed data between WTP and WTA

Ecosystem Services/Value Amount	Willingness to pay	Willingness to accept
From 1 FCFA - 25 000 FCFA		
Land services	86.28	86.28
Sea services	46.46	46.9
Medicinal plants	33.63	34.51
Mangroves	29.65	29.2
Tourism	86.26	86.28
From 26 000 - 50 000 FCFA		
Land services	1.77	1.33
Sea services	0.88	0.88
Medicinal plants	1.33	0.88
Mangroves	1.33	0.88
Tourism	1.77	1.33
From 250 000 - ≥300 000 FCFA		
Land services	0.44	0.88
Sea services	0.44	0
Medicinal plants	0	0.88
Mangroves	0	0.88
Tourism	0.44	0.88

Source: The Authors (2022).

Table 9 - Willingness to pay and willingness to accept by gender

Willingness to pay				
Value	**Male**	**Percentage**	**Female**	**Percentage**
1 – 25000 FCFA	132	58.41	89	39.38
26000 - 50000 FCFA	0	0	4	1.77
250000 - > 300000 FCFA	0	0	1	0.44
Total	132	58.41	94	41.59
Willingness to accept				
1 - 25000 FCFA	130	57.52	91	40.26
26000 - 50000 FCFA	1	0.44	2	0.88
250000 - > 300000 FCFA	1	0.44	1	0.44
Total	132	58.41	94	41.59

Source: The Authors (2022).

Table 10 below enunciates the summary of the statistical parameters for ecosystem services, which are considered the focal points of community life, both for community and national development.

Table 10 - Statistical parameters of variables

Ecosystem Services	Land Services	Sea	Medicinal Plant	Mangrooves	Tourism
Total sample	226	226	226	226	226
Positve Answers	200	108	82	70	200
Negatives Answers	26	118	144	156	26
Percentage:	100	100	100	100	100
Positive Answers	88.50	47.47	36.28	30.97	88.50
Negative Answers	11.50	52.21	63.72	69.03	11.50
Mean	1.884956	1.477876	1.362832	1.309735	1.884956
Standard error of the mean	.1262755	.0429337	.050855	.0535795	.066314
Median	2	1	1	1	2
Standard deviation	.3197836	.5006191	.4818842	.4634105	.3197836
Variance	.1022616	.2506195	.2322124	.2147493	.1022616
Interval	1.880068	-.123172	.2011394	.1886341	.297525
Minimum	1	1	1	1	1
Maximum	2	2	2	2	2

Source: The Authors (2022).

Table 11 expresses the statistical value of the investigated ES regarding un/willingness to pay for the services. The results portrayed the respondents' attitudes regarding the structural challenges in the nation, and compliance to instituted policy in Guinea-Bissau (Oliveira; Silva, 2010; Sousa *et al*., 2017; Cramez *et al*., 2021). Many of those who refused to pay attributed their decisions to the socioeconomic condition of the country which disallowed them from contributing to such services, so it is understood in this framework that they had the willingness. The cross-reference of the investigated ES also affirmed that CVM is a stated preference approach, and this is reflected in Table 11: the welfare provided by the ES and the policy regulating the involvement of the people regarding prohibitions and funding. Regarding the medicinal plants, many of the respondents did not consider it as an ecosystem service worth paying for to ensure sustainability, particularly the healers, except a very minute number amongst them (See 4.2.3.).

Table 11 - Statistical parameters of reason to pay and not paying

Ecosystem Services	Land Services		Sea		Medicinal Plant		Mangrooves		Tourism	
	S	P	S	P	S	P	S	P	S	P
Reason to pay										
Contributing for a good reason	136	62.39	85	37.61	67	26.65	57	25.22	143	63.27
This program is worth this value	46	21.1	18	7.96	9	3.98	6	2.65	40	17.7
I feel we should protect the forest	3	1.38	3	1.33	2	0.88	3	1.3	4	1.77
To pay my share contribution	2	0.92	0	0	1	0.44	1	0.44	2	0.88
Other reasons	13	5.75	2	0.88	3	1.33	3	1.33	11	4.86
Reason for not paying										
It is unfair to expect me to pay	9	3.98	38	16.81	58	25.66	53	23.45	4	1.77
This program is worth nothing to me	4	1.77	42	18.62	43	19.02	52	23	4	1.77
I do not think the program works	9	3.98	10	4.42	16	7.08	16	7.08	8	3.54
I oppose any government program	2	0.88	8	3.54	11	4.87	11	4.87	1	0.44
I have no money to pay	1	0.44	9	3.98	8	3.54	11	4.87	6	2.65
others reasons	1	0.44	11	4.87	8	3.54	13	5.75	3	1.33
Total willingness to pay	200	88.5	108	47.79	82	33.28	70	30.97	200	88.5
Total reason for not paying	26	11.5	118	52.21	144	63.71	156	69.03	26	11.5
Total sample & percentage	226	100	226	100	226	100	226	100	226	100

S: Sample; P: Percentage.

Source: The Authors (2022).

Growth and development indices in Guinea-Bissau

The result presented in Table 12 articulates the growth and development indices of Guinea-Bissau. The analysis used a secondary data from the World Bank's World Development Indicators 2020. It was utilised in order to project the contributions of CNP ecosystem services on growth, (as measured by gross domestic product [GDP]) and development (as measured by GDP per capita) over the past 10 years. In the assessment conducted during the study, information on the typical number of tourists visiting the CNP annually was also gathered from the CNP secretariat. It was revealed that the top five ecosystem services selected on the basis of their active activities in the region, would cost approximately 5,065,812,500 billion FCFA annually, while the GDP per capita was estimated to be 2574.09 FCFA. This was calculated by multiplying the number of ecosystem services that the population would be willing to pay 12,500 FCFA for and further multiplying it, by the average number of visitors to the Cantanhez Park over the last 10 years. This implies that assigning monetary value to ecosystem services has the potential to boost economic growth and enhance both the welfare of individuals and national economy, as the worth of the ES is known and preservation and sustainability of the same become key in improving and sustaining the economy (Sajise *et al.*, 2021; Mitchell; Carson, 1989; Holzman, 2012; Perni *et al.*, 2021).

Table 12 - Growth and development indices of Guinea-Bissau

Year	GDP (FCFA in Billions)	GDP per capita (FCFA in Billions)	No of Visitors at CNP	N. of Total Populations
2011	518 288 000 000	331 599	70835	1562996
2012	505 078 658 700	314 694	62103	1604981
2013	516 662 157 300	313 459	63042	1648259
2014	520 872 300 700	307 765	74891	1692433
2015	619 725 621 200	356 737	79302	1737207
2016	698 684 930 600	391 984	86530	1782434
2017	783 989 395 300	428 844	100036	1828146
2018	835 741 534 500	445 894	107291	1874304
2019	843 500 000 000	439 113	116552	1920917
2020	824 100 000 000	418 750	49846	1967998
Average	666 664 259 830	374 885	81053	1761968
Value of ecosystem in CNP	[a]5 065 812 500 CFA	[b]2 574 CFA		

[a]Average WTP 12500FCFA multiplied by average number of tourists (81053) annually which gives 1,013,162,500FCFA. Given that 5 ES were examined in this study, then 1,013,162,500FCFA multiplied by 5 equals 5,065,812,500 FCFA additional income. [b]Average per capita income for CNP 2,574.09FCFA is from average total income (5,065,812,500 FCFA) divided by highest population (1967998). The highest population is employed to avoid overvaluation of per capita income.

Source: World Bank (2022). Elaborated by the Authors (2022).

CONCLUSION

This paper has appraised the contributions of ecosystem services to development and national growth in Guinea-Bissau, utilising Cantanhez National Park as a case study, through the application of the contingency evaluation method. The research is specifically carried out to assess the ways through which ecosystem services contribute to the economic development process of the country, and their significance to sustainable growth in Guinea-Bissau. The monetary valuation of the selected five ecosystem services indicates that the willingness to pay for any service is primarily driven by the welfare they provide and the regulatory policies, while the belief system is secondary. Likewise, consumers' economic status is a significant determinant of the amount that people are willing to pay. The research underlines the importance of maintaining ecological services to ensure a healthy ecological environment and a sustainable economic growth in Guinea-Bissau, particularly the communities that can directly benefit from the services. The study concludes that periodic ecosystem service valuation is crucial for growth and sustainable development because it helps policymakers and the government to make informed decisions; understand population preferences; as well as know the reason people do not find consumption of certain services optimal. Subsequently, policymakers and the government can take actions that will enhance the ecological service for greater output.

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