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Assessment of the Socio-Economic and Environmental Impacts of the Artisanal Landing Stage at Yimbaya Kinssi in the Urban Commune of Gbessia (1994-2024)

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Abstract

This study assesses the environmental impacts and socio-economic balance of the unimproved artisanal landing stage at Yimbaya Kinssi in the urban commune of Gbessia in the Republic of Guinea. The results show a monthly surplus, which indicates the profitability of the activities which are conducted in landing stage, namely: the sale wood for osmoking fish, cooking salt, fishing, and small businesses, but with delegated fiscal management. However, these activities are accompanied by deforestation (60%) between 1994 and 2024, with a total area exploited by humans of 184,449 m^2 in Yimbaya (Kinssi port) m^2 linked to the massive use of wood, construction of dwellings and pollution from untreated waste. This landing stage, among others in the city of Conakry (Republic of Guinea), although economically profitable, exerts significant ecological pressure. The study recommends good governance combined with economic performance and sustainable management measures.

Keywords

Landing Stage, Deforestation, Pollution, Small-Scale Fishing, Economic Balance, Durability

1. Introduction

Ocean-related activities (such as fishing, shipbuilding and ship operation, tourism, aquaculture, oil and gas exploration, biotechnology and other maritime activities) make a significant contribution to the global economy and human nutrition [1]-[4]. According to the World Bank, total aquatic animal production rose from 19 million tons (live weight equivalent) in 1950 to a record 179 million tons in 2018 (an annual growth rate of 3.3%). This annual rate fell slightly by 1% in 2019, before rising slightly by 0.2% to reach 178 million tons in 2020, with a total estimated value of USD 406 billion in sales in the fisheries and aquaculture sector, including USD 265 billion for aquaculture [5]. The special case of the artisanals landing stages in Africa in general, and in the Republic of Guinea in particular, play a crucial role in the socio-economic environment of coastal riverain population, as a transit node for activities the linked to the sea. They constitute living places where economic and social activities intersect, contributing significantly to local supply [6] [7]. However, they are threatened in certain parts of Africa by a growing industrial development, considered part of the blue economy, and in other areas by strong growth in human activities, which are now exerting increasing pressure on the natural environment like: deforestation, water pollution, overexploitation of resources, riverbank degradation, uncontrolled urbanisation, etc. [7] [8]. The Republic of Guinea, a country in West Africa, is a coastal country with 300 km of Atlantic coastline and a maritime geography marked by several key features, namely: the Atlantic coast, ocean currents, and coastal areas [5]. Its climate is tropical, with rainfall varying from 4,000 mm (coastal regions) to 1,300 mm (Upper Guinea) between July and August, with temperatures ranging from 20˚C to 36˚C and maximum humidity of 80% to 85% [6]. The main coastal activities are fishing, salt extraction, forester exploitation, trade in sea products, etc. This economic sector, whether it involves landing stage improved or unimproved facilities, contributes significantly to food security, which was estimated at an average consumption of 21.5 kg per household between 2009 and 2018. The Imported sea products in average are in the order of 9,800 tons with a commercial value of 345 billions GNF between 2009 and 2018. However, average exports was estimated at 19,060 tonnes for 190 billions GNF, or a surplus trade balance of 155 billions GNF on average from the fishing sector to the state budget [5]. According to the assessment by the National Institute of Statistics (INS), for example, the added value of fishing was 1,815 billion GNF, representing 3.7% of the national GDP, or 49,426 billions GNF (5.6 millions USD) (DNPM, 2018; INS, 2017) [6]. This financial contribution could be improved if the authorities in charge could take measures layoutment and good management of nearly 250 municipal landing stages improved and unimproved communal landing stages located in the Republic of Guinea. At this level, commitments to improve certain landing stages have been made by the authorities for some time now, namely Kaporo, Téménitaye, Boulbinet in the city of Conakry, followed by an ambitious program to modernize the Boffa landing stage in Guinea by the sustainable development project for artisanal fishing (P2DPA) led by Charente-Maritime Cooperation and the local prefecture [9]. These layoutments concern the establishment of certain basic infrastructures important to fishing activities. Therefore, this work will focus on the study socio-economic, environmental and management impacts of one of the unimproved landing stages over the last thirty years with a view to their future improvements. To this end, the assessment will be done in the form of a survey of the authorities and users of this landing stage, using pre-designed files survey forms. This assessment will therefore enable a better understanding of the environment and economic flows of the site in order to guide public policies in terms of training, financing, or the organization of supply chains and risks for sustainable development.

2. Materials and Methods

2.1. Presentation of the Study Area

This study was conducted at the Yimbaya Kinssi landing stage in the urban commune of Gbéssia, Conakry region, capital of the Republic of Guinea (**Figure 1**). The commune of Gbéssia is limited to the north by the Leprince road, to the east by the transverse road number 3 (T3) extending over the Tannerie river, to the west by the Dabondy shallows and to the south by the seaside

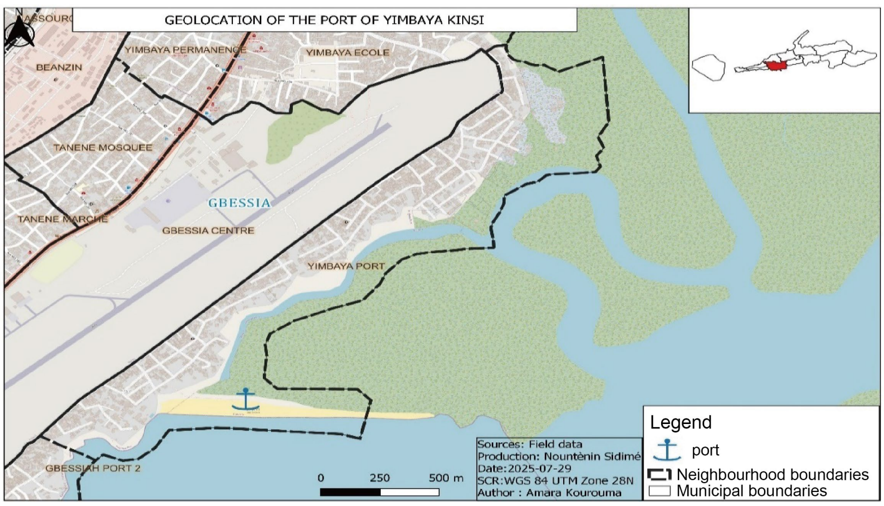

Figure 1. Shows the geolocation of the Yimbaya Kinssi landing stage. *Source: Field data*, *Production: Nountenin Sidimé*, *Date:* 2025-07-29; *SCR: WGS*84 *UTM Zone* 28 *N*, *Autor: Amara Kourouma*.

The survey data collection took place from April to May 2024 on the Yimbaya Kinssi artisanal landing stage site, in the urban commune of Gbéssia. A total of 75 people were surveyed using precise defined questionnaires. These respondents, coming from different user groups (fishermen, fishmongers, traders, transporters, local authorities and administrative), were selected using a purposive sampling method, making it possible to target the main actors involved in the site's activities Fishermen represented 50% of the sample, followed by wood merchants (25%), transporters (20%), and salt merchants (5%). In addition, semi-structured interviews were conducted with local authorities and community leaders. Direct observation of the site made it possible to assess the state of the infrastructure, environmental practices and socio-economic dynamics. Finally, a map of the site was developed using satellite images (Landsat 5 and 8) and open geographic data, georeferenced under WGS 84 (UTM zone 28N) (**Figure 2**). Some activity points Practiced within the landing stage are shown in the (**Figure 3**).

- ***Description methods used***

Types of land use were analyzed from Landsat 5 (1994) and Landsat 8 (2024) satellite images, in using QGIS software and coupled with classification supervised by the Orfeo toolbox. Four classes were defined: built-up area, vegetation, water body, and bare soil. Using a confusion matrix and field data collected by GPS, the classification accuracy was evaluated and resulted in an overall accuracy rate of 87%. This made it possible to identify the evolution of deforestation and the expansion of urban areas around the artisanal landing stage.

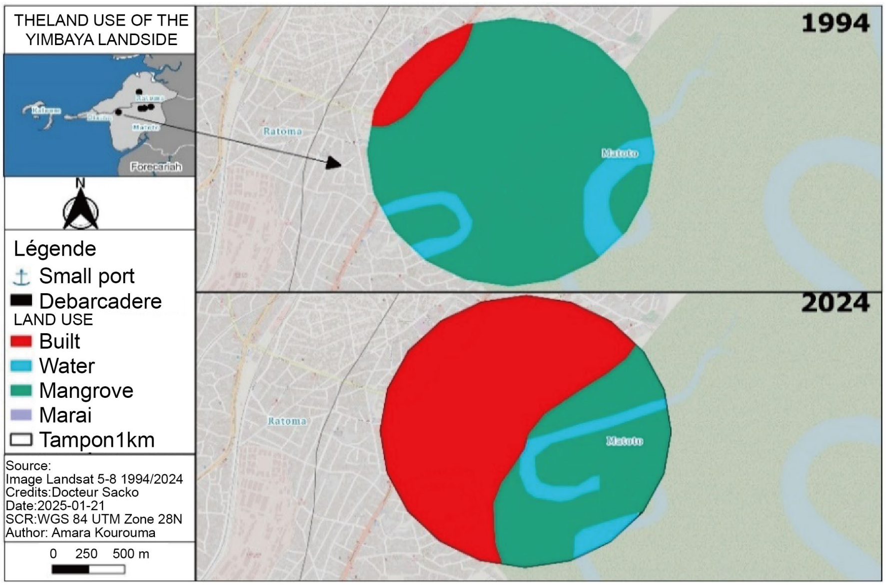

Figure 2. Shows the destruction of the mangrove around of landing stage of Yimbaya Kinssi between 1994 and 2024.

(a) (b)

(c) (d)

Figure 3. Showing (a) fish landing place; (b) wood storage and sale; (c) wood transport and (d) fish smoking place in the Yimbaya Kinssi landing stage.

2.2. Physicochemical Analysis of Soil Samples and Seawater from the Landing Stage

The environmental conditions in which seafood is handled generally determine its commercial, nutritional qualities, etc. Thus, physicochemical parameters such as: temperature, pH, turbidity, dissolved oxygen concentration, salinity and the presence of heavy metals or organic matter are indicators of the healthiness of water and soil in landing areas and who lead to a loss of their market value, must be determined [10]. The analysis of these parameters makes it possible to identify environmental risks linked to the decline in quality of seafood and find avenues for improvement for better economic and health sustainability, must be determined.

Methods

Two types of sampling and measurements were performed: the first concerned the seawater sample collected and keep in a cooler and the soil sample second collected and keep in polystyrene plastic. The sampling points are: (seafood landing points and pirogues parking, wood storage, fish smoking and within a 50 meter perimeter of the landing stage. The samples were transported to the laboratory for physicochemical and bacteriological analyses of seawater and soil sample.

Protocol for levy and analysis water

- *Equipment used*
    - *Sterile bottles* (500 *ml*).
    - *Gloves*, *labels*, *cooler with thermometer inside*.
- *Protocol*

Take between 20 and 30 cm below the water surface, away of the source of pollution.

- Rinse the bottle twice with the water to be sampled—Close tightly then label with: (place, date, time).

- *Keep cool* (4˚C) *then transport to the laboratory at* 6*-hour intervals*

- *Parameters to analyze*
  - *Physicochemical: pH, temperature, conductivity, turbidity, BOD, COD, nitrates, phosphates, iron, ammonium.*
  - *Biological: total coliforms, fecal coliforms, E. coli.*

Protocol for levy and analysis water of soil

- *Equipment used*
  - Stainless steel trowel.
  - crowbar for digging the soil.
  - Bags zip in polyethylene.
  - Gloves, labels.
- *Protocol*
  - Scrape the first 2 - 5 cm.
  - Levy at 10 - 20 cm of depth—Air dry if not analyzed immediately.
- *Parameters to analyze*
  - Physical: texture, structure, moisture content.
  - Chemical: pH, organic matter, NPK, heavy metals (Pb, Cd, Hg, etc.), CEC.

3. Results and Discussion

3.1. Results after Polls

Observations of the unimproved Yimbaya Kinssi landing stage have shown different types of human aggression on the coastal environment over the last thirty years. The results of the areas and percentages of occupied land are mentioned in (Table 1 and Figure 4 and Figure 5) highlighting different types of land use, among other the perimeters of urban areas, cultivated areas, Mangroves, marshes, construction from 1994-2024 in these localities.

Table 1. Shows the area occupied between 1994-2024 of the landing stage of Yimbaya Kinssi.

Years 94		Years 24	
Built	19.91	Built	184.449
Mangrove	259.777	Mangrove	102.546
Marai	0	Marai	0
Water	29.395	Water	22.087

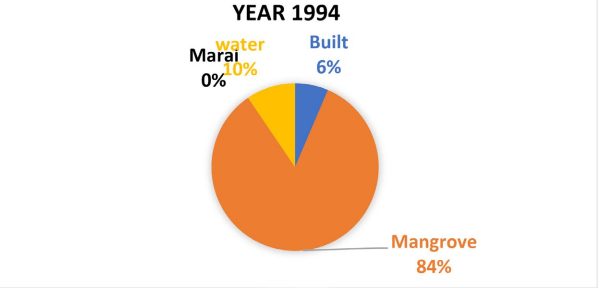

Figure 4. Shows the perception of environmental impacts as a percentage of degraded areas (1994).

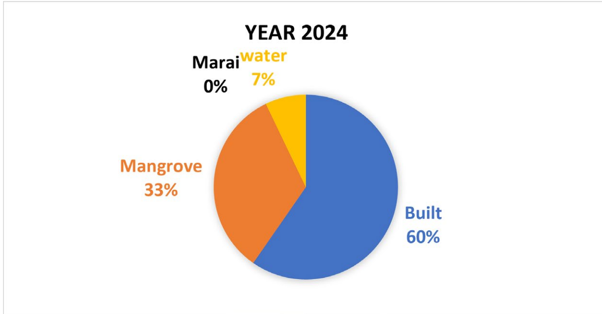

Figure 5. Shows the perception of environmental impacts as a percentage of degraded areas (2024).

3.1.1. State of Play of the Landing Stage (Yimbaya Kinssi)

✓ ***Environmental pollution and its impacts***

Other pollution findings have been observed such as: discharge of direct waste of all kinds (solid or liquid) into the sea such as: polystyrene, plastics in melted polymers to be used in the restoration of canoes discharge of dangerous liquids linked to the maintenance activities of canoe propulsion engines and other fishing tools (nets), which are the cause of degradation of marine habitats and loss of biodiversity [11] [12]. Greenhouse gas emissions (carbon dioxide CO_2) linked to smoking fish with the use of fuel wood. No sustainable practices observed.

✓ ***Infrastructure, physical state and functioning***

Buildings, docks, conveyors, cranes, storage facilities, garage for maintenance of canoe propulsion engines, ice-making equipment for preserving fish products, etc. that increase efficiency and reduce costs are absent.

✓ ***Policies and regulations***

(navigation laws, occupational health and safety (weak and ineffective), lack of signage, precarious or muddy ground, very slippery environment)

✓ ***Management Model***

The management model observed in this landing stage is a delegated fiscal model. Local governance of the landing stage is ensured by an active committee composed of five members, including the president, vice-president, secretary, treasurer, and user representatives (fishermen, merchants), but which is poorly trained.

✓ ***Type of tax recovery encountered in this landing stage***

- Monthly recovery.

✓ ***Social***

- Adduction of water or access to drinking water, latrines, toilets Absent
- Lack of gloves, tables, etc.
- Handling seafood on the floor
- Remark presence of flies, reptiles and other stray animals such as dogs, cats, etc.

Conservation of seafood products

- Conservation in the sun, without ice
- Bags filled with salt stored on the ground in humidity

- Cool room for the conservation of the seafood products, absent

✓ ***Santary risks***
- Food poisoning
- Dirty water used to wash seafood and plates owners of cheap eating places in landing stage
- Risks of contamination (fish, hands) present

✓ ***Economic aspects***

- ***taxed activities***
  - Taxes on the landing of seafood products by pirogue operators and on the use of an area ranging from 15 m² to 6 m² by each user of the landing stage
  - Taxes on seafood products (fish, wood, cooking salt, etc.)
  - Taxes on pirogue parking
- ***Who collects?***
- Maritime Navigation Agency (ANAM)
- ***Perception Methods***
  - Direct payment by users (fishermen, traders etc.) with payment receipt
- ***Is there a retrocession coming from the maritime navigation agency* (*ANAM*) *after payment of taxes?***
  - No retrocession coming from the maritime navigation agency (ANAM) after payment of taxes. Retrocession planned for the maintenance or development of landing stage (cleaning, security, repairs, construction of infrastructure)

3.1.2. Socio-Economic Contribution of Activities or Simulation of the Local Trade Balance

The results of our investigations showed that the activities carried out in this landing stage generate a source of income for the local populations with 40 to 45 canoes available. According to the testimonies collected, the fishermen declare being able to sell 100 kg of fish per canoe (40,000 GNF/kg) per day, 800 units of wood per day or (3,000 GNF/steres) in 20 days and 20 bags of cooking salt sold per day (4,500 GNF/kg) in 25 days (**Table 2**), other small businesses 1,200,000 GNF/month.

- *Description methods estimated economic values used*

The estimated economic values found in this study were obtained from precise questionnaires and semi-guided interviews with users (fishermen, timber and salt traders and small businesses selling various items) in the landing stage, including the owners or regular users of the 40 to 45 canoes recorded. In the collected data, the average daily volume of quantity of fish caught fish caught are included namely: income generated from the sale of fish, wood and salt, as well as current expenses. Information was compared between several respondents and with collection records available from local site managers. An average was calculated from the responses obtained in order to limit exaggerations or errors in the respondents' statements. This triangulation (or data collection method) made it possible to obtain reliability of the economic results presented.

Table 2. Showing estimated economic receipts (entrance)

Products	Number of days of activity	Quantity	Unit price	Total value
Fresh fish	20	100 Kg	40.000/Kg	80.000.000 GNF
Wood	20	800 units of product sold (st.)	3000/steres	48.000.000 GNF
Cooking salt	25	20 bags	4500	2.250.000 GNF
Total				**130.250.000 GNF**

Or 3000 steres of wood = 3000 m^3 of stacked wood.

Table 3. Showing approximate economic expenditure per month.

Expenses	Amount/unit	Total amount
Purchase of ice	300000	300.000
Fuel	1500000/canoe	60.000.000
Fishing nets and equipment (hooks)	500000	500.000
Dock maintenance	Volontary	
Motorized canoe with propulsion engines (tax paid to the agency)	275000/an	11.000.000
Non-motorized canoe without propulsion engines (tax paid to the agency)	155000/year	6.200.000
Taxes on the exploited space of (15 m^2)	50000	50000
Taxes on the used space of 6 m^2	20000	20000
Other small business	50.000/per month	50.000
Total		**78.120.000 GNF**

Calculation of the trade balance in receipts (BCR) = (Table 2) + small business

Small business turnover products sold: 1.200.000 GNF (for 20 days of activity)

Receipts *total* = 1200.000 GNF × 20 days = 24.000.000 GNF

BCR = 130.250.000 GNF + 24.000.000 GNF = **154250000 GNF**

Calculation of the trade balance expenses (BCD) = (Table 3) + **small business: (**sales of rice, coffee, drinks, various items (phone chargers, nets, fish hooks), plastics, ice), ***expenses*** 1.050.000 GNF

(BCD) = 78.120.000 GNF **+** 1.050.000 GNF = **79.170.000 GNF**

Final calculation of the local trade balance (**BCL)**

BCL = **BCR – (BCD)** =154.250.000 – 79.170.000 GNF = **75.080.000 GNF**

BCL = **75.080.000 GNF**

Surplus balance is: 75.080.000 GNF per month either: **900.960.000 GNF** per year, beneficial to local economy

3.2. Physicochemical Analysis of Water and Soil Samples from the Yimbaya Kinssi Landing Stage

Analyzing these parameters allows us to know the degree of soil and water pollution in order to assess their impacts on the quality of fishery products which determines their commercial value, the health of users and to take corrective or preventive measures for sustainable management of the landing stage. To do this, values were found and interpreted which are recorded in (Table 4 and Table 5).

Figure 2 shows the level of degration of the mangrove around of landing stage of Yimbaya Kinssi between 1994 and 2024. However, the results (Table 1, and Figure 4, and Figure 5) indicate the level of environmental degradation of these landing stages which is around 60% of aggression caused by human activities between 1994-2024. Before 2024, the occupied areas were (6%) (Figure 4), in 2024 the occupancy percentage is (60%) (Figure 5) are: (184,449 m^2) in Built, (102.546 m^2) in Mangrove et (22.3087 m^2) in Water compared to 1994, which is at: (19.91 m^2) Built, (259.777 m^2) Mangrove, (29.395 m^2) in Water (**Table 1 and Table 2**). In tropical regions, mangroves cover nearly 75% of the coastline, with an estimated surface area of between 14 and 23 millions hectares worldwide [13]. In the Republic of Guinea, mangroves are estimated to be 60% degraded. This deforestation of mangroves observed at Yimbaya Kinssi is in line with national trends

Table 4. Showing the physical and chemical parameters of the water of the landing stage and interpretation.

Sample	Potential impact parameters	Values found	Unit	Method of analysis	Recommended limit	Interpretation
Sea water	pH	6.59	-	Potentiometry	6.5 - 8.5	Slightly acidic can influence the solubility of elements and alter water quality (this acidification is often linked to pollution)
	Temperature	25.6	˚C	Thermometer	≤30	The temperature of 25.6˚C is below the critical threshold of 30˚C, promoting the physicochemical stability of the water and favorable to marine species
	Conductivity	2655	µS/cm	Conductivity meter	<5000	This found value reflects moderate mineralization, below the maximum limits. This may indicate possible intrusion of polluted or chemical freshwater.
	Turbidity	98.6	FUT	Turbidimeter	100	Remains close to the acceptable limit, reflecting relatively clear water but slightly loaded with suspended particles.
	Nitrates	1.2	mg/L	Spectrophotometer	≤50	Values too low, this shows excessive dilution (rain, because we are in the heavy rain season in Conakry)
	Phosphates	0.12			≤0.5	
	Total iron	0.08	mg/L)		≤0.3	
	Ammonium	0.05	mg/L		≤0.5	
	(DCO)	15	mg O_2/L	COD reactor coupled to a spectrophotometer.	≤40	It is not very polluted in terms of organic matter.
	DBO5	4.5	mg/L	DBO Incubator	**≤5**	A slightly low organic pollution parameter
	dissolved salts rate	2257.89	mg/L	Conductivity meter	<3000	Indicates abnormal dilution of seawater by polluted water, which can affect biodiversity, health safety and the commercial value of products.

(DCO) = Chemical oxygen demand, (DBO5) = Biological Oxygen Demand.

Table 5. Showing the physicochemical parameters of the landing stage soil samples and interpretation.

Parameters	Land (wood storage area) E1	Land (near the fish smoking oven) E2	Land (canoes parking) E3	Land (50 m from the landing stage) E4	Criteria	Interpretation
Texture	Sandy loam	Clayey sand	Sandy	Clayey sand	-	Samples E1 good aeration and rapid drainage thanks to the sand. loam gives moderate water and nutrient retention capacity, E2—Coarse texture (due to the sand), with cohesion its particles thanks to the clay in. More drainable than sand. Clay retains water and nutrients more than sand alone. E3, very lightweight, drains water quickly. With low water and nutrient retention capacity. E4, a coarse texture, sticky to the touch when wet. Better drainage than clay, but less efficient than sand. Higher water retention than in sandy soil.
Structure	Lumpy	Massive to lumpy	Slightly lumpy	Lumpy	-	
Moisture content (%)	19.81	24 ?74	16.51	13.49	10 à 25 in weight	Values close to normal
pH	7.71	8.27	7.35	8.54	6.5 - 8.5	The values of E1, E3 are within the criteria. This ensures adequate availability of essential nutrients and heavy metals. However, the value of the sample E2 and E4 have slightly elevated values (therefore alkaline environment)
Organic materials (%)	3.25	4.02	2.78	2.95	> 2	The organic matter in all 4 samples is appreciable to support biological activity
Total nitrogen (%)	0.18	0.22	0.15	0.17	0.1 - 0.3	NPK (nitrogen, phosphorus and potassium), the main soil nutrients, are within the recommended limits for all four samples, indicating a nutrient-balanced soil.
Phosphorus (P_2O_5) (mg/kg)	28	35	25	30	15 - 40	
Potassium (K_2O) (mg/kg)	95	110	85	90	80 - 200	
Lead (Pb) (mg/kg)	12	35	22	18	<70	The content of lead, cadmium and mercury (pollutants whose high concentrations can contaminate seafood) its below critical thresholds, confirming the absence of chemical contamination and acceptable environmental quality.
Cadmium (Cd) (mg/kg)	0.25	0.48	0.32	0.27	<3	
Mercury (Hg) (mg/kg)	0.08	0.12	0.09	0.07	<1	
CEC (cmol(+)/kg)	14	15	13	12	10 - 25	CEC which means that the soil can store nutrients the values found indicate an average capacity for retaining cations

CEC = Cation exchange capacity.

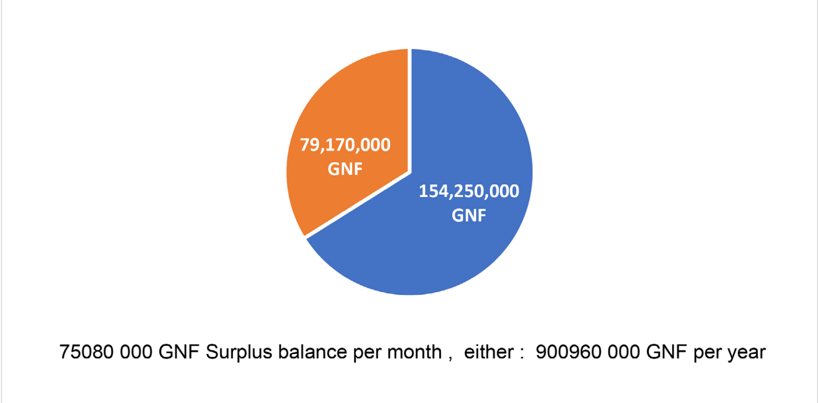

Figure 6. Showing artisanal landing stage of Yimbaya Kinsi approximate monthly income and expenditure and surplus balance per month and year.

observed by the FAO (Food and Agriculture Organisation of the United Nations), which estimates a reduction in mangrove area of nearly 1.04 million hectares between 1990 and 2020 [14]. To further support this analysis, specific local factors such as the intensive use of wood for smoking fish and construction contribute significantly to the reduction in mangrove area in this coastal zone (**Figure 3(b)** and **Figure 3(c)**). These anthropogenic pressures are also supported by the absence of sustainable management and reforestation mechanisms. What should be remembered is that artisanal fishing, a maritime activity for the local supply of fishery products, continues to suffer from the degradation of its ecosystem and poor management of artisanal landing stages [15]. The management model observed in the landing stage visited (Yimbaya Kinssi) is a delegated tax model. The state is limited to collecting taxes paid by each user of these landing stages, with little or no direct involvement in the organization of the landing stage. Daily management is carried out by the users themselves. The study of the overall trade balance of this artisanal landing stage shows a not negligible surplus of: 75,080,000 GNF in only 20 days of activity (**Figure 6**).This shows that this landing stage produces more income than it spends, which indicated his local socio-economic profitability and can be a source of sustainable income for the authorities to support actions to modernize and build infrastructure in this landing stage, this denotes particular attention in terms of governance.

According to [15], the modernization of fishing landing stages in the world has made it possible for the production of seafood to reach 171 million tons. This figure shows that landing stage have had an impact on the performance of artisanal maritime fishing in many countries, for example: France and Guinea [14]. Despite the important role that these artisanal landing stages play in local and national economies, compared to other areas of food production, this sector is still suffering [16]. These physical and chemical analyses of soil and seawater samples made it possible to assess possible sources of pollution in order to ensure the economic sustainability of the landing stage. These physical and chemical analyses of soil and seawater samples made it possible to assess possible sources of pollution in order to ensure the economic sustainability of the landing stage. These physical and chemical analyses of soil and seawater samples made it possible to assess possible sources of pollution in order to ensure the economic sustainability of the landing stage. To this end, the results of the parameters analyze obtained which have been interpreted and who are in the (**Table 4**), are of acceptable but fragile quality. Parameters such like pH, COD, nitrates, heavy metals, etc., are roughly in the recommended limits, indicating a current environmental status that is appreciable. This may be due to the non-production of major pollution such as polluting activities caused by current users of the site (fishing, traders, etc.). Nevertheless, with these values very close to the limits, it indicates that the environment is highly vulnerable to future pollution. This situation can negatively affect the quality and commercial value of seafood products, the environmental and sanitary conditions of the landing stage, with a decline in buyer confidence and their possible withdrawal from the market.

4. Conclusion

Respondents highlighted an absence of infrastructure and safety in the landing stage. This contributes significantly to the reduction of their income. In addition, the management of this landing stage is based on a flawed management model of delegated tax, whereby the state merely collects taxes paid by users on fishing activities, fish sales, cooking salt, wood, and small businesses, rather than modernising or maintaining the site. No retrocession or return of money from the maritime navigation agency (ANAM) amount planned for the maintenance or development of the landing stages (cleaning, security, repairs, construction of infrastructure, etc.). The perception of environmental impacts presents a deforestation of (60%), followed by pollution and reduction of water level of (from 10% to 7% between 1994 and 2024) (**Figures 2-5**, **Table 1** and **Table 2**) which can be attributed to the activities of timber trade and construction of buildings by local residents. The impact of fishing is more moderate compared to logging. However, it has provoked some visible negative impacts on the environment such as: degradation and pollution of marine habitats, pressure on marine resources. The study of the trade balance of this artisanal landing stage shows that the landing stage has a profitability with a surplus of 75,080,000 GNF in only 20 days of activity and therefore actively contributes to the local economy (**Figure 6**). Although the measured physicochemical parameters are within acceptable limits, these values mask advanced degradation of the landing stage environment, which is characterised by the gradual loss of natural habitats and excessive anthropogenic pressures. This expose the ecosystem, making it vulnerable and at high risk of future disturbances. This shows the need to act immediately on the participatory, integrated and sustainable management method

5. Recommendations

Install a device drinking water and washing system, raise user awareness of hygiene rules, create appropriate transformations spaces, encourage the installation of certain small necessary equipment such as: coolers, refrigerator freezers, nets, insecticides, stainless steel tables, installation of a mini quality control system and standards, using simple control tools such as: thermometer, rapid detection of microorganisms, training of staff in periodic checks of cleanliness of sales areas, equipment and water used, etc.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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