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## Estimating the value of beach recreation in Benin

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### ABSTRACT

The economic valuation of recreation services provided by ecosystems is attracting increased research attention. This is also the case in developing countries and in Benin in particular. This study focuses on beach recreation and intends to inform public policies regarding the government's seaside tourism development strategy and coastal regeneration programme. Based on a sample of 213 local, national and international visitors of Fidjrossè beach, the study provides the first estimation of consumer surplus for beach recreation services. It applies the Individual Travel Cost Method (ITCM), tests several count models, and adopts a negative binomial regression which best fits the data. The results highlight that beach recreation is preferred over other leisure activities by a majority of respondents, reflecting its worth as a recreational setting. The number of visits to the beach per year is determined by a variety of variables, including travel costs, visitors' education level and sex. The estimated visitor surplus (XOF 512.69; USD 0.87 USD for the total expenses per visitor per visit) is fairly low and is discussed with regard to the methodological limitations of the study, methodological issues that still need further investigation and the structural specificities of tourism in Benin.

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## Introduction

Like most developing countries characterized by extreme poverty, Benin has a weak diversified economy. Its growth rate mainly depends on agriculture ( $\pm 36\%$  of Gross Domestic Product [GDP]) (PAM, 2017), which is very vulnerable to climate hazards. This weakens its economic stability and limits wealth creation. Just like many other West African countries which are not endowed with mineral resources, Benin has adopted a tourism development strategy and has been implementing it. The aim is to attract national and foreign currencies. Considering its history and geographical location, Benin has a number of tourist resources and attractions, including mountain ranges, the W and Pendjari National Parks, some historical sites and museums, and a coastline of 125 km ('Conseil Économique et Social' [CES], 2010).

More recently, the government has focused on stimulating seaside tourism, which has hitherto remained under-exploited in Benin. This was notably done by launching the 'Fishing Route Tourism Development Project'. This major project aimed at valorizing Benin's coastal heritage has an estimated initial total cost of USD 238 million to be funded exclusively by public borrowing (CES, 2010). The project covers 32 km of coastline

and includes the beaches of Fidjrossè, Adouanko, Avlé-kété and Djègbadji. It is viewed as a means to increase the contribution of tourism to the national economy. Tourism contributed to 6% of the real GDP over the period 2011–2014 ('Conférence des Nations Unies sur le commerce et le Développement' [CNUCED], 2017). Although this is higher than in most west African countries – the average contribution of tourism to GDP in those countries was of 4.5% over the period 2011–2014, and 5% in 2015 (CNUCED, 2017) – it is lower than in African least developed countries (LDCs) with a coastline. Indeed, countries such as the Gambia, Madagascar, Senegal, Tanzania and Mozambique, all of which share some similarities with Benin, recorded a higher tourism contribution to real GDP, with a share of 20.5%; 12.3%; 11.4%; 11% and 7.2% respectively over the period 2011–2014.

Yet, the implementation of this tourism strategy raises different questions relating to how the seaside has to be valorized and developed for tourism. To be carried out in a sustainable way, the implementation framework needs to take into account several elements currently affecting the coast and beaches in Benin. First, Benin had to cope with coastal degradation over the past decade, and the

country has been putting much effort to protect its coast from erosion. An instance is the second Phase of the East Coast Cotonou Protection Project, budgeted 36.7 billion CFA francs according to the statistics of Ministry of Environment and Development in 2017. Second, the coastal areas are home to around 50% of the population ('Ministère de l'Environnement et de la Protection de la Nature' [MEPN], 2007), and beaches are also used by national residents. Third, there is free access to most of the beaches, making them a common good.

Of course, this is not a situation typical of Benin as it is well known that coastal areas and beaches in many developing countries receive high numbers of visitors and different groups of users (Pascal et al., 2016). This can create congestion, but also other forms of externalities as some users and visitors may misuse and/or even alter and degrade beaches, which in turn might compromise their use for tourism and recreation (Halkos & Matsiori, 2018). This situation reflects a phenomenon coined the tragedy of the commons (Hardin, 1968). In Benin, the coastal erosion affecting beach quality can be partly seen as an illustration of the consequence of human actions on the commons goods (Pojani, 2017).

In the light of the above, and with the aim to inform public policies on the preservation and enhancement of the coast, it is argued in this paper that it is important to investigate further the benefits and costs of beach tourism and recreation in Benin, and elsewhere. This is particularly true when one considers that governments tend to internalize environmental costs by either introducing new taxes or a user fees (e.g. entrance fee to a beach), drawing on different theories such as Pigou's tax theory (1932) or Coase's contract theory (1960). However, and as was highlighted in Zhang et al. (2015), maintaining both the development and the characteristics of the beaches in the long term requires an effective beach management policy. Such policy needs to take into account the considerable investment efforts that tourism development and coastal protection lead to, and the long term benefits that users can derive from the flow of services of this natural capital (Demont & Sourzac, 2011), economically but also in terms of their well-being. Yet, this can't be done without an assessment of the economic value of beach recreation aimed at adequately informing allocation decisions (Lockwood & Tracy, 1995).

This paper aims to contribute to such valuation by investigating the different profiles of beach users in Benin, and the economic value they attribute to their recreational use of beaches. To do so, the study applies the individual travel cost method (ITCM) to the case of Fidjrossè beach, in Benin. As will be highlighted in the paper, the model considers beach recreation as a

package of leisure activities taking place on beaches. It takes into account the different profiles of beach users in Benin, and the economic value it estimated they attribute to their recreational use of beaches. This is done using a consumer surplus perspective, and an harmonized estimation method for transportation costs. The model includes variety of variables highlighted in the literature for their explanatory power of frequencies of beach visits: Travel costs, socio-economic variables, visitor's perception of beach quality and of existing substitution options. Data was collected using a face-to-face survey method on a 213 convenience sample. The visitor surplus per person per visit to Fidjrossè beach is estimated as the inverse of the opposite coefficient associated to the variable of the transportation cost in the regression consistently with the work of Pascoe (2019), Mulwa et al. (2018), Zhang et al. (2015) and Pascoe et al. (2014).

As Benin is barely examined in the (beach) recreation and tourism literature, the paper increases knowledge about this specific country, and similar western African contexts. The ITCM method has been chosen following the literature review, which is reported in Section 2. Section 3 describes the methods used for data collection and the model adopted in the study. The results are presented in Section 4 and are followed by a short conclusion in which the limitations of the study are discussed and recommendations are made to policy-makers.

## Literature review

### *Conceptualizing and valuing beach tourism and recreation economically*

Recreation or leisure has economically been conceptualized as a certain amount of time that could have been devoted to paid work. As such it can be regarded as an economic good consumed by the individual for the sake of distraction (Mannell & Kleiber, 1997) and that can contribute to their well-being. Such recreation or leisure can take place on beaches and take heterogeneous forms, such as swimming, surfing, walking, fishing, walking, contemplating the sea and so on. Although such heterogeneity led Pascoe (2019) to suggest a model based on the activities that visitors mostly undertake when visiting a beach, we decided within the framework this study to consider beach leisure activities as a package when it comes to estimate consumer surplus. Indeed, we argue that beach leisure is often composed of several activities that most often cannot really be dissociated, and some visitors may find it difficult to identify or reveal what their main activities are.

As is highlighted above beaches in Benin are most often accessed free. In other words, the use of the leisure services provided by beaches is not traded on a market. Therefore, the economic value of such services has to be determined based on non-market valuation techniques (Peng & Oleson, 2017; Zhang et al., 2015; Pascoe et al., 2014; Lockwood & Tracy, 1995; Navrud & Mungatana, 1994). Specific techniques exist for the evaluation of this type of good, as is shown in a number of recent studies that sought to value non-tradable natural assets. These techniques differ from those adopted in valuing private goods or tradable goods and services, which are market-driven, and are expressed in monetary terms. The difference with non-tradable goods and services is that these are often priceless; their values can hardly be deduced from markets. Non-market valuation techniques are generally grouped into two main approaches: the revealed preference approach (including the travel cost method, hedonic price modelling, etc.), and the declared preference approach (including the contingent valuation method, the multi-attribute choice method).

The travel cost method (TCM) is one of the most popular methods to estimate recreational values. It aims to convert the physical and social benefits generated by outdoor recreation into monetary terms (Ward & Beal, 2000). This method is the oldest of the evaluation methods and was used for the first time by Hotelling (1947) before being improved. Since then, it has been applied frequently when it comes to estimating the recreational value of recreational sites, such as nature parks and beaches (Roussel et al., 2016; Zhang et al., 2015; Pascoe et al., 2014). TCM is based on the estimate of the recreation demand function, from which estimates of consumer surplus can be derived. The basic theory of the method for assessing non-market goods or services is that the travel costs are the implicit price that visitors pay for consuming the goods or services (Phaneuf & Smith, 2005). The analysis of the relationship between the travel costs to participate in beach tourism or recreation and the demand – measured by the number of visits per year on a particular beach, leads to a relative demand curve. Generally, the demand curve is decreasing, that is, the higher the cost, the fewer the visits. Specific regression methods are used to determine the relationship (Dong et al., 2018; Zhang et al., 2015; Pascoe et al., 2014; Englin & Shonkwiler, 1995; Creel & Loomis, 1990).

It is worth noting that TCM has been applied using two different approaches to data collection, with consequences for the accuracy of the valuation results: the individual Travel Cost method (ITCM) developed by Brown and Nawas (1973) and Zonal Travel Cost Method (ZTCM) by Clawson and Knetsch (1966). ITCM

uses a very detailed survey to collect information on the travel expenses of individual travellers when they enjoy an outdoor recreational site. It allows to include the total costs in a generating function for trips, hence to predict the number of visits. Moreover, it allows for the integration of individual socio-economic characteristics into the function. Willis and Garrod (1993) showed that the ITCM gives a much closer estimate to the real value (consumer surplus) of the public good to be assessed.

In ZTCM, a set of areas surrounding the site is delimited, and data (mainly secondary) are collected and analysed by area with other zonal characteristics. It assumes that the behaviour is identical for each individual in an area, which can be deemed unrealistic. This hypothesis consists in building concentric circles around the site under scrutiny. The successive circles are delineated as each circle corresponds to the same distance from the site, hence the same travel costs for potential visitors. Differences in the number of visits between zones are considered to be determined by differences in travel costs, whilst taking into account population differences. As ZTCM aggregates and averages data, it may be inaccurate (Ward & Beal, 2000) given that individual characteristics of visitors affect travel expenses. For these reasons, the individual travel cost method (ITCM) was used in this study.

According to Haab and McConnell (2002), the number of trips to a site follows a non-negative whole distribution. Therefore, ordinary least squares (OLS) methods are unsuitable for estimating the recreation demand function. Count models are generally considered to be more appropriate (Pascoe, 2019; Creel & Loomis, 1990). Hellerstein (1991) evidences the interest of count models in order to control for censoring and the integer nature of the travel demand when analysing travel costs with aggregated data. He discusses two models, the Poisson and the negative binomial, and notes that the choice of the estimator can have a considerable impact, especially on the estimation of the consumer surplus. The value of the surplus is therefore sensitive to the count model used.

### *Extant knowledge on the economic value of tourism and/or recreation in natural areas*

Several studies have sought to assess empirically the economic value of leisure services provided by natural areas, including beaches and parks. Studies using TCM are summarized here, highlighting the method adopted and the results they obtained.

In his study of Mooloolaba Beach, Australia, Blackwell (2007) used a negative binomial truncated individual

travel cost model. The study showed that beach recreation provides considerable benefits to residents, and highlights that different determinants of recreational beach visits: income, on-site and off-site travel expenses, time, group size and employment status. The author also noted that the values of passive beach use are higher than those of national parks or forests. Also using ITCM, Prayaga (2017) estimated the value of beach recreation for the inhabitants of a lake in Australia. The results indicated that the values for the use of the beach by the inhabitants differ according to their visiting habits. This information was essential to evaluate the strategic options associated with beach protection and management. Using an ITCM model that encapsulates the heterogeneity of beach leisure activities, Pascoe (2019) noted different levels of consumer surplus depending on the use visitors make of the beach. Pojani (2017) applied ZTCM to estimate the economic value of Shëngjini beach tourism, Albania. Using a compilation of a demand curve for beach tourism the study showed that coastal erosion and sea-level rise will affect the quality of the beaches. It stated that knowledge of this value is a strong support for the various projects that will be undertaken by the public authorities for the protection and development of the area in the future.

Several studies used multiple count models. This is the case of Mulwa et al. (2018) who used ITCM on a single site and four different count models: the zero truncated Poisson model, the zero truncated negative binomial model, the negative binomial model with endogenous stratification and the Poisson model with endogenous stratification. Collecting data on 323 visitors of the Maasai Mara national Park, Kenya, they estimated a consumer surplus of USD 115 per visitor per day; which corresponds to a recreational value of the park of USD 73.076 million per year. Considering that the optimal conservation costs of the park was estimated at USD 86.90 per day, hence lower than the consumer's surplus, they advise managers increase the entrance fee in order to maximize revenues and invest in alternative facilities in order to increase expenses on the site. Dong et al. (2018) used the truncated Poisson, a truncated negative binomial distribution, and on-site Poisson models, to address errors caused by truncated samples and endogenous stratification. Their estimation of tourist demands and recreational benefits on Nanwan Beach, Taiwan, was also based on a survey. Their analysis led them conclude that on-site Poisson model was the most appropriate for their case.

It may be concluded from this review, that TCM is the method that is most widely used in empirical studies that assess the value of beach tourism and recreation. TCM is based on an estimate of the function of recreational

demand from which the consumer surplus is derived. The strength of TCM resides on the fact that is based on the actual experiences of visitors (Mendelsohn & Olmstead, 2009; Pascoe, 2019). As the goods on which the beach leisure activities are based are non-commercial, the expenses incurred to go to the beach constitute an implicit price for the value granted to the beach recreational activities. By establishing the empirical relationship between transportation costs and attendance rates, one can estimate a demand function for recreation (Clawson, 1959; Knetsch, 1963). Moreover, as was shown by Hellerstein (1991), the consumer surplus estimation is sensitive to the choice of count model. The aforementioned works however have not concluded on a standard type of count models. The type of count model adopted in each study is based upon the behaviour of the study data.

## Methodology and data

This study will focus on the case of Fidjrossè beach, Benin. Although the country records visitors on its various beaches (i.e. Akpakpa, Semè-Kpodji, Fidjrossè, Togbin, Avlékété, Djègbadji and Grand-Popo), Fidjrossè beach has been selected for it is the most visited beach in Benin, and it receives both national and foreign visitors. Access for recreational use is not penalized by an entrance fee. The beach is located in the economic capital Cotonou, and is used both for leisure activities and as a fishing zone.

The study adopts an ITCM approach given it is considered more accurate than the zonal approach. The method is deemed appropriate for this study because of the public character of Fidjrossè beach. The various expenses incurred to get there therefore can be regarded as constituting an implicit price for beach recreation. It allows us to estimate the visitor's demand function and then deduct consumer surplus from it, reflecting in this way the value of beach recreation (see for instance Mulwa et al., 2018; Pascoe, 2019, etc.). Data was collected using face-to-face questionnaire. The survey included variables on travel costs, socio-economic profile of the visitors, the perception that the recreational site could be substituted by another or not, and the perceived quality. These variables were included in the study to explain the frequency of beach visits.

Consistently with the works of Mulwa et al. (2018), Pascoe et al. (2014), Pascoe (2019) and Zhang et al. (2015), the consumer surplus per user during a visit to the beach was estimated as the inverse of the opposite coefficient associated with the variable of the transportation costs in the regression. The measurement of transport costs in this study was harmonized to avoid

dispersion. Only the point of departure, i.e. the neighbourhood in Benin from which the respondent departed to go to the beach and the number of people accompanying the respondent were taken into account. This implies that the means of transport were not taken into consideration when estimating travel costs. This is a limitation in the study for visitors departing from the same location will have travelled the same distance but obviously, those using a car will have spent more to reach the beach than those using a motorbike or bicycle. This also means that for international tourists, the expenses that occurred internationally were not taken into account. This is because the visit to the beach was hardly the first motive for travelling to Benin. Beach tourism is rarely a trigger for travelling to the country.

### Model

The demand for recreation denoted by the average number of visits per year is assumed to be a function of the travel cost, considered as an indirect measure of its price, the socio-economic characteristics of the visitors and the characteristics of the site. The generic demand curve for an individual  $i$  can be given as

$$Y_i = f(X_i) + \varepsilon \quad (1)$$

With  $Y_i$  the average number of visits to the site per year.  $X_i$  denotes factors influencing demand and  $\varepsilon$  a random error assumed independent and identical.

This demand for recreation constitutes a count variable. The most widely used distribution law for counting variables is the Poisson distribution (Cameron & Trivedi, 1986; Creel & Loomis, 1990; Hellerstein, 1991; Wooldrige, 2015, chapter 17, p. 851). Thus the Poisson model represents the most appropriate model for the characteristics of the beach recreation demand variable. Indeed, Poisson models have the advantage of avoiding the regression bias caused by the fact that the dependent variable can only take non-negative integer values (Dobbs, 1993; Zhang et al., 2015). In addition, because of the dispersion generally noted between the variability and the mean in the Poisson models, the negative binomial model is recommended (Creel & Loomis, 1990). It is more appropriate in case of excessive dispersal, and therefore allows the variance to be higher than the mean value. The theoretical model, according to Wooldrige (2015), can be written as follows:

$$E\left(\frac{Y}{X}\right) = \exp(\beta X) \quad (2)$$

$$E(Y/(x_1, x_2 \dots x_n)) = \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n) \quad (3)$$

where  $\beta_n$  is the estimated negative binomial regression coefficient for this variable in the model and  $\beta_0$  is a constant.

$Y$  is the dependent variable represented here by the mean for the number of visits per year to the beach. The survey was conducted on-site, so non-visitors are not taken into account; thus the use of a zero truncated negative binomial estimation model is most appropriate. As noted by Blackwell (2003) and Bowker and Leeworthy (1998), negative truncated zero binomial regression addresses the analysis bias caused by a truncated dependent variable.

However, Creel and Loomis's (1990) truncated count models admit the influence of non-visitors in a limited way (Hellerstein, 1991). First, for Tobit estimators and Poisson models, incorrect specification of the highest moments will bias estimates of demand parameters. Although the negative binomial model is robust to the misspecification of the highest moments (Grogger & Carson, 1988), all of these models are sensitive to the assumption that non-visitors possess the parameters of the demand for purchase required for visitors. To the extent that this is false, truncated models may be more biased than aggregated models. In other words, global models allow non-observers to influence the estimate, so that the resulting parameters are a reduced form incorporating information about visitors and non-observers (Hellerstein, 1991). For many purposes, such as calculating the consumer surplus for a new population, these parameters may be higher than those produced by truncated models.

The net benefits to visitors from using a recreational site can be measured as a consumer surplus. Indeed, consumer surplus, the measure of non-commercial benefits for beach recreation, is the difference between what it would be theoretically willing to pay to practice beach leisure and what it is actually required to pay (Pascoe et al., 2014). This is the most commonly used measure for the net benefits of visitors. It is the net satisfaction derived from the leisure activities on the beach; that is, the difference between the visitor's total willingness to pay for travel and the actual cost of the trip (Dribek & Voltaire, 2017). Using Poisson regression or negative binomial regression, consumer surplus per trip per person is estimated as the negative inverse of the coefficient of the travel cost variable in the regression (Mulwa et al., 2018; Pascoe et al., 2014; Zhang et al., 2015).

### Data

The data was collected with a face-to-face visitor survey on the beach of Fidjrossè from July to August 2013. The

sample size of 215 statistical units takes into account cost and budget constraints and is therefore determined by the cost method ( $n = B/Cu$  where  $n$  is the sample size,  $B$  is the available budget and  $Cu$  is the unit cost of the questionnaire). A non-probability convenience sampling method was used to retain our sample size of 215. The unavailability of a sampling frame on beach visitors implied that each individual in the population did not have a known probability of being included in the sample. Visitors were approached along the beach, were introduced to the survey and invited to take part. Respondents were thus selected based on their availability and willingness to take part in the survey. Children

aged under 15 were excluded for the population to ensure that each respondent fully understood all the questions. Of the 215 questionnaires that were administered, two (02) were excluded because of their young age, leading to a final sample of 213 respondents. As individuals are often reluctant to comment on their socio-economic characteristics such as age and income, this information was collected at the end of the administration when after trust was established. This strategy allowed us to avoid non-responses to the question of the respondents' monthly salary.

### Survey design

The main variables collected in the study include: (1) the demand for beach leisure expressed in terms of the visitor's average number of visits per year, the type of visitor, the time spent per beach visit, the various expenses incurred in connection with the visit to the beach; (2) socio-economic variables such as gender, age, education, income, socio-professional category and so on; and (3) dummy variables, namely the visitor's perception of their visit to the beach compared to other leisure options (e.g. theatre, etc.), their assessment of the quality of the beach and the existence of an alternative site.

The various expenses incurred by the visitor comprise: transportation costs, and other expenses expressed in XOF and incurred on site such as restaurant expenses and costs for hut rental, etc. Transportation costs reflect the cost of a round trip for the individual to the beach. The perception of the beach leisure is binary and takes the value 1 if the visitor qualifies the visit to the beach better than other leisure options and 0 if not. Regarding the quality of the beach some respondents raised issues concerning the sanitary conditions and/or safety, whilst others did not raise any. Consequently, beach quality was treated as a binary variable which takes the value 0 when the respondent has not expressed any concern, and 1 when they raised one or more issues. This variable reflects the respondent's sensitivity to the quality of the beach visited. When respondents stated that they visited other beaches than Fidjrossè beach, the variable 'existence of a substitution' took the value 1; it otherwise took the value 0. The type of visitor is a categorical variable taking the value 0 when the respondent was a local resident, and 1 when they were national or foreign visitors.

### Results and discussion

This section presents the descriptive results, and the estimation obtained using our aforementioned ITCM-based

**Table 1.** Characteristics of the respondents.

Categorical variables	Frequency of Yes	Percentage (%)			
Sex					
Female	54	25.35			
Male	159	74.65			
Age category					
[15–18]	8	3.76			
[18–30]	116	54.46			
[30–40]	52	24.41			
[40–50]	29	13.62			
[50–60]	5	2.35			
[60; +]	3	1.41			
Type of visitor					
Local residents	32	15.02			
National visitors	156	73.24			
International visitors	25	11.74			
Education					
No	6	2.82			
Primary	12	5.63			
Secondary	81	38.03			
Tertiary	114	53.52			
Income (in XOF)					
50,000 and less	95	44.60			
[50,001–150,000]	76	35.68			
[150,001–500,000]	32	15.02			
500000 and more	10	4.69			
Occupation					
Civil servant	32	15.02			
Private staff	28	13.15			
Student	77	36.15			
Unemployed	7	3.29			
Retiree	3	1.41			
Group visit					
No	113	54.59			
Yes	94	45.41			
Opinion					
No better	78	36.62			
Best	135	63.38			
Sensitivity to beach quality					
No bad	10	4.78			
Bad	199	95.22			
Existence of substitution site					
No	110	52.13			
Yes	101	47.87			
Continuous variables	Obs.	Mean	Std.	Min.	Max.
Average number of visits over the past 12 months	213	12.18	5.70	1	22
Time spent (in hour)	213	6.71	2.18	1	14
Group size	207	2.35	1.92	1	11
Transportation costs	204	987.25	1268.88	0	9000
On-site expenses	212	2424.06	7540.50	0	100,000
Total expenses of a visit	213	3349.53	7737.15	0	100,000

model. From the estimation results, visitor surpluses were derived based on the different types of expenses incurred. The analysis was done using Stata software package.

### Descriptive statistics

The characteristics of the respondents are shown in Table 1. Respondents were primarily male (74.65%) and adults. Only 3.76% were under 18, suggesting that all respondents had the required understanding of the questionnaire. The majority were aged between 18 and 40 (78.87%). Respondents were well educated with either a tertiary (53.52%) or a secondary (38.03%) level of education. All categories of occupation were represented in the sample with students (36.15%) and self-employed (30.99%) being most represented. Respondents were mainly part of the lower income categories as 44.60% of the sample earned less than XOF 50,000 per month, and 35.68% between XOF 50,000 and 150,000. Only 4.69% had a monthly income higher than XOF 500,000.

Two categories of respondents could be distinguished in the sample. The first category is composed of respondents living in the vicinity of Fidjrossè beach and will be referred to as 'residents' here below. The second category include those who came from other localities and countries; they are national and international visitors or tourists, and will be referred to as 'users' here below. Users were most represented in the sample (84.98%), and primarily included national visitors (73.24% of total sample).

Concerning respondents' visiting behaviours of beaches in Benin, 47.87% went to at least one other beach apart from Fidjrossè beach. Half the sample visited the beach alone (54.59%), and 45.41% of respondents were accompanied with at least one family member or friend for whom they supported the costs. Respondents spent on average XOF 987 for transportation costs (see Table 1). Respondents reaching the beach on foot were attributed not expenses, which explains our minimum transport cost of 0 XOF. On average the respondents spent XOF 2424 on site. Respondents cited a wide range of activities that they indulge in when visiting the beach. Activities that were mostly cited were watching the waves and/or the landscape, and walking. Other often cited activities included: playing football and/or volleyball, swimming, picnicking, resting, etc. The majority of visitors (63.38%) viewed beach recreation as better than any other recreational options.

With respect to the number of visits in the last 12 months, respondents found it difficult to accurately

remember the number of their visits. The respondents were also asked how often they visited the beach, on a 3-point scale: 53.99% claimed they visited the beach on a frequent basis, 25.82% visited it sometimes and 20.19% rarely. The answers to this question were controlled by the question about the average number of visits made per week, per month or per year. From this, it was possible to determine an average number of 12.18 visits a year. All respondents claimed to visit the beach at least once a year. On average 6.7 h were spent on the beach per visit. Time spent on the beach varied between 1 and 14 h.

### Determinants of beach recreation demand

A first step has been to run a bivariate analysis and test the relationships between our independent variables and the frequencies of beach visits. A Pearson correlation test was carried out on continuous variables. Negative and significant correlations were found with *transportation costs* ( $-0.1897$ ;  $p \leq 0.05$ ) and *on-site expenses* ( $-0.1778$ ;  $p \leq 0.05$ ). The Pearson correlation test revealed a significant positive relationship between the average number of beach visits per year and *time spent on the beach* ( $0.1048$ ;  $p \leq 0.05$ ). For categorical variables a *t*-test was used to determine whether they could explain differences in visit frequencies. Results showed significant differences for four variables: *sex* ( $t = -2.7981$ ;  $df = 211$ ,  $p = 0.005$ ) with women being likely to have lower visit frequencies than men; the *type of visitors* ( $t = 4.9398$ ;  $df = 211$ ;  $p = 0.000$ ) with local residents being likely to visit the beach more frequently than other users; *visitor's opinion regarding other recreation options* ( $t = -5.1496$ ;  $df = 211$ ;  $p = 0.000$ ) with those finding that beach recreation was not a better option being likely to visit the beach less often than those who think differently; and *visitor's perception that the beach could be substituted by another recreational site* ( $t = 3.2465$ ;  $df = 209$ ;  $p = 0.0014$ ), with higher visit frequencies from those who don't think of any alternative sites. Test results were not significant for visitors' sensitivity to beach quality, level of education, age and visitor income.

A second step was to test several count models, and select the count model that would be used as a basis for our economic valuation (Table 2): the Poisson model, the negative binomial model, the truncated negative binomial model and the zero-inflated Poisson model. The analysis of the outcomes obtained using these different models showed that the negative binomial model best fitted our data. Indeed, a deviance goodness-of-fit test for Poisson regression indicated overdispersion (i.e. the conditional variance exceeded the conditional mean for the number of beach visits).

**Table 2.** Estimation results of Poisson models and binomial negative by ITCM, with different variables of travel cost.

Variables	Poisson model			Negative binomial model		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Transportation costs	-0.0624** (0.0256)	-	-	-0.0654* (0.0382)	-	-
On-site expenses	-	-0.117*** (0.0265)	-	-	-0.131*** (0.0428)	-
Total expenses	-	-	-0.0767*** (0.0187)	-	-	-0.0830*** (0.0289)
Beach visit compared to other options: No better						
Excellent	0.225*** (0.0532)	0.169*** (0.0646)	0.216*** (0.0511)	0.229*** (0.0775)	0.182* (0.0999)	0.226*** (0.0767)
Assessment of beach quality: No bad						
Bad	-0.0123 (0.115)	-0.101 (0.198)	0.0230 (0.114)	-0.0532 (0.177)	-0.0801 (0.349)	-0.0152 (0.180)
Time	0.0455*** (0.0114)	0.0722*** (0.0146)	0.0465*** (0.0111)	0.0488*** (0.0171)	0.0818*** (0.0235)	0.0518*** (0.0173)
Sex: Female						
Male	0.263*** (0.0665)	0.352*** (0.0798)	0.328*** (0.0638)	0.276*** (0.0968)	0.394*** (0.123)	0.349*** (0.0957)
Age category: [15–18]						
[18–30]	0.145 (0.134)	-0.0358 (0.142)	0.102 (0.133)	0.141 (0.193)	-0.120 (0.225)	0.0644 (0.196)
[30–40]	0.141 (0.149)	-0.0235 (0.160)	0.0612 (0.146)	0.140 (0.214)	-0.0991 (0.257)	0.0298 (0.218)
[40–50]	0.291* (0.154)	0.222 (0.177)	0.189 (0.153)	0.320 (0.226)	0.185 (0.282)	0.191 (0.230)
[50–60]	0.0705 (0.207)	-	-0.0970 (0.206)	0.103 (0.308)	-	-0.112 (0.316)
[60; +]	0.387 (0.253)	-	0.184 (0.250)	0.364 (0.396)	-	0.111 (0.406)
Existence of an alternative site: No						
Yes	0.0473 (0.0536)	-0.0154 (0.0648)	0.0182 (0.0522)	0.0538 (0.0804)	-0.0356 (0.102)	0.0140 (0.0795)
Type of visitor: Locals residents						
Other users (National and international visitors)	-0.215*** (0.0808)	-0.136 (0.0967)	-0.201*** (0.0744)	-0.195 (0.127)	-0.102 (0.163)	-0.175 (0.121)
Income category: 50,000 and less						
[50,001–150,000]	-0.0704 (0.0639)	-0.125 (0.0768)	-0.0790 (0.0614)	-0.0930 (0.0970)	-0.152 (0.126)	-0.104 (0.0963)
[150,001–500,000]	-0.102 (0.0840)	-0.117 (0.108)	-0.115 (0.0789)	-0.142 (0.129)	-0.181 (0.174)	-0.159 (0.125)
More than 500,000	0.0733 (0.126)	0.268 (0.175)	0.0948 (0.120)	0.0310 (0.204)	0.246 (0.315)	0.0560 (0.201)
Education: No						
Primary	-0.285* (0.165)	-0.566*** (0.217)	-0.263 (0.160)	-0.303 (0.262)	-0.621 (0.378)	-0.305 (0.259)
Secondary	-0.262* (0.135)	-0.555*** (0.183)	-0.285** (0.135)	-0.270 (0.217)	-0.598* (0.335)	-0.311 (0.222)
Tertiary	-0.403*** (0.133)	-0.658*** (0.178)	-0.403*** (0.133)	-0.410* (0.213)	-0.706** (0.327)	-0.422* (0.218)
Intercept	2.569*** (0.266)	3.294*** (0.379)	2.722*** (0.250)	2.594*** (0.417)	3.385*** (0.658)	2.794*** (0.408)
Diagnostics						
Obs	164	121	179	164	121	179
Log likelihood	-518.8	-390.8	-573.6	-497.0	-367.2	-546.1
ll_0	-575.5	-444.8	-644.0	-518.9	-386.9	-572.3
chi2	113.4	107.9	140.8	43.90	39.45	52.43
p(chi2)	0	0	0	0.000595	0.000937	3.21e-05
r2_p	0.0985	0.121	0.109	0.0423	0.0510	0.0458
Alpha				0.107	0.139	0.117

Note: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . Standard errors are reported in brackets.

This implied that a negative binomial regression was a more appropriate model than a Poisson regression. Applying the truncated negative binomial or the zero-inflated Poisson models did not improve the estimation results. Furthermore, an analysis of the maximum likelihood estimator of the different count models confirmed that the negative binomial regression better

fitted our data. Chi-square statistics were significant, meaning that the coefficients of all the independent variables were not simultaneously zero. Based on the above diagnostic tests, the negative binomial model was found to be robust. Consequently, only the results of the negative binomial model will be reported and discussed below.

Table 2, column 'negative binomial model – tests 1, 2 and 3', suggests that the determinants of the demand for beach recreation (i.e. number of beach visits a year) include: travel costs, on-site expenses, total expenses, time spent on the beach during a visit, respondent's sex, level of education and their opinion relative to other recreation options.

Consistently with what was expected, the sign of the relationships between the three expense items and the demand for beach recreation was negative. This indicates that respondents with higher (transport, on-site and total) costs generally visit the beach on a less frequent basis than those with lower costs. These results are consistent with those found by Blackwell (2007), Dong et al. (2018); Mulwa et al. (2018) and Zhang et al. (2015). They can be explained by the inverse relationship that exists between the price and quantity consumed of a good according to the law of demand. They also in line with the microeconomic theory of Gossen (1854), which states that the individual maximizes his utility under the constraint of his income.

Another interesting result is the visitor's appreciation of beach leisure compared to other leisure options such as going to the cinema, visiting zoos and so on. The positive relationship found shows that the use of the beach for recreation purposes is determined by the importance attributed to the beach as a recreational setting. A visitor who appreciates beach recreation is likely to significantly visit the place more often than those who do not, all things being equal. This result confirms Mulwa et al. (2018)'s conclusion in which the authors argue that a higher level of tourist satisfaction is likely to induce an increased tourist demand. Relating to satisfaction is the positive relationship found between time spent on average per beach visit and the frequency of visits. One could suggest that time spent on the beach could indirectly be a sign of satisfaction regarding the beach recreation experience.

The study results also indicate a relationship between respondents' sex and the frequency of visits on the beach, with men being more likely to visit Fidjrossè beach more often than women ( $p < 0.01$ ). This result could be explained by the amount of domestic work that is done by women in Benin, impacting negatively on women's leisure time. This is in line with Dong et al. (2018) and Zhang et al. (2015) who found that male tourists make more leisure trips than female travellers. However, it is worth noting that our descriptive statistics show that women spend on average more time (7.16 h) than men (6.56 h) per beach visit. This suggests that there might be a slight difference in consumption behaviour between men and women, with men going to the beach more regularly than women but for a shorter period of time.

Another result that requires attention is the relationship found between the level of education and the demand for beach recreation. The results show a negative relationship ( $p < 0.01$ ) with the tertiary level of education, suggesting that those with a university degree visit the beach less frequently than those with no formal degree. This result should be taken with caution though as only 6 respondents had no formal education. The number of people with a university degree was much greater (114), suggesting that the level of precision of our data might be higher for the latter category. The literature shows contrasting results with respect to the influence of the level of education. On the one hand, a negative relationship was also found in Zhang et al. (2015). On the other hand, Dong et al. (2018) found that tourists with a masters' degree or a PhD made more trips to Nanwan Beach in Taiwan than others. They explain this by the fact that the higher socio-economic status of tourists gave them more time and money to participate in leisure activities at Nanwan Beach.

### Estimating the visitor's surplus

Drawing on Blackwell (2007), Dong et al. (2018), Mulwa et al. (2018), Pascoe et al. (2014), Pascoe (2019), and Zhang et al. (2015), the visitor's surplus was estimated as the inverse of the coefficient of expenditure incurred by the visitor in absolute value. However, due to the log-linear interpretation, this inverse is multiplied by 100 as is the case in Mulwa et al. (2018). Indeed, the variables relating to the various expenses have been linearized in the model. The visitor's surplus per visit could be estimated considering that the coefficients of our three expense items being significant. The main results of the surpluses are presented in Table 3.

The average number of people per group during a visit is 2.35; the surplus per visitor and per visit is obtained by dividing the previously calculated surplus by 2.35. Thus the surpluses per visitor and per visit are shown in Table 4.

**Table 3.** Visitor's surplus per trip for the three expense items.

Variables	Visitor's surplus
Transportation costs	1529.05 XOF
On-site expenses	763.36 XOF
Total expenses of a visit	1204.82 XOF

**Table 4.** Visitor's surplus per person per visit.

Variables	Surplus
Transportation costs	650.66 XOF
On-site expenses	324.83 XOF
Total expenses of a visit	512.69 XOF

Our study shows that the visitor's surplus in terms of transportation costs and on-site expenses (food, rentals, etc.) are respectively XOF 650.66 (USD 1.11) and XOF 324.83 (USD 0.55). The visitor's surplus per visit relating to their total expenses is approximately XOF 512.69 (USD 0.87).<sup>1</sup> This level of surplus is very small when compared with the results of previous work in the literature; in Kenya, which is also a developing country, the estimated surplus per visitor during a visit is 115 USD (Mulwa et al., 2018).

Several reasons could explain such difference, and the low surplus found in this study. A first explanation is methodological and relates to the convenience sampling method. The degree to which the study sample is representative of the population of Fidjrossè visitors is unknown. A second reason, also methodological, concerns the harmonized method that was applied when measuring transportation costs. This method neglected the important difference that can result from the use of a particular means of transport over another. A third reason, also methodological, is the fact that accommodation expenses (e.g. in hotels or hostels) was not taken into account in our study, as was done in Zhang et al. (2015). This, however, relates with our third reason, and which concerns the structural features of tourism consumption in Benin. Indeed, as beach recreation is not a main motive for travelling to Benin, it was considered by the researchers that it was unlikely that a night spent in a hotel or international airfares would be associated with a demand for beach recreation. It is worth noting that there is no consensus in the literature on TCM regarding the inclusion of additional costs such as accommodation or food costs in travel costs (Beal, 1995; Rolfe & Dyack, 2011). For instance, Pascoe (2019) finds it unnecessary to consider catering costs when applying TCM. Indeed, the individual may eat in a restaurant before reaching a beach or buy food at the beach, and bring it back home. Consequently, it is argued that the validity of our model is not weakened by not having taken accommodation expenses into account.

### Concluding remarks

This study aimed to contribute to the literature on seaside tourism and the economic valuation of beach recreation in particular. Given that the recreational services provided by beaches are not traded on a market, their economic value cannot be controlled based on a trading price. Therefore, one relies on other econometric methods to estimate this economic value. The study applied ITCM and the negative binomial regression as a count model. The principle was to estimate a consumer surplus based on expenses incurred by a sample of

visitors when travelling to a beach. To estimate travel costs, the study has developed a harmonized method for the calculation of transportation expenses, and has included on-site expenses, including expenses on food, rentals, etc., in the estimate of the total costs. The results of the study indicate that the use of a harmonized method for estimating transportation cost might have an effect on the end-results in terms of visitor surplus. Indeed, the visitor surplus found in this study is particularly low compared with that found in other pieces of literature, including in African countries (see the work of Mulwa et al., 2018, on Kenya).

However, the low visitor surplus found in this study might also be attributed to Benin's specific tourism context. As such the study offered some pioneering evidence for the case of Benin, which could also serve as a knowledge base for coastal tourist destinations in which beach tourism has not (yet) been developed. The coast of Benin, and Fidjrossè beach in particular, attracts many visitors. These visitors are local residents, but also national and international users. With regard to the latter, Fidjrossè beach may not be the main motive of the destination for foreign tourists, but is visited in complementarity with other tourist destinations in Benin. The study shows that a majority of visitors (63%) considered beach recreation of the best alternative among all leisure opportunities that were offered to them in Benin (e.g. home entertainment, outdoor recreation activities in other settings). Such preference for the beach illustrates its worth as a recreational setting.

Concerning the specific case of Fidjrossè beach, the study highlighted several determinants of demand for recreation. Significant negative relationships were found with travel expense (i.e. transportation cost, on-site expenses and total expenses), which is coherent with the economic law of demand. Significant positive relationships were found with time spent on the beach, and respondents' opinion that the beach was a better leisure option, and with the fact of having a tertiary level of education. It was also found that men are more likely to go more frequently to the beach than women, though their visits tend to be shorter. From the estimated demand for recreation, visitor surpluses were estimated. These surpluses are of the order of XOF 650.66 (USD 1.11) for transportations costs; of XOF 324.83 (USD 0.55) for on-site expenses, and of XOF 512.69 (USD 0.87) for total costs per visitor and per visit. The analysis of consumer surpluses highlights that visitors would be likely to spend more on transportation costs than for on-site services.

The study has also pointed to the influence that a choice of count model can have. Although, in this work, the difference between the results found with the Poisson model and with the negative binomial model is

not substantial, it stresses the importance of testing different count models when using ITCM. Another methodological issue that would deserve further attention is the inclusion of expenses for tourist accommodation and other on-site expenses. There is no clear indication that these expenses need to be included in the analysis or not. One of the limitations of this study is that it was carried out on a single public beach and with a convenience sample. In this respect the results found in this study would need further validation with studies covering other beaches in Benin, and wherever possible, a sampling technique that is more representative (probability sampling techniques or a quota technique). A final limitation of our study is at the level of the data used which date from 2013. The results may vary if more recent data are used.

Nevertheless, this study allows us to derive some recommendations aimed at information political decision-making regarding the mobilization of public funds to stimulate seaside tourism. Since Fidjrossè beach is one of the most attractive beaches in Benin, these results should inspire public decision-makers in terms of coastal development policies for the development of seaside tourism. They imply that beach recreation can generate financial resources – though rather limited – that would help diversifying the economy. The funds could either be invested in developing beach tourism or recreation or in protecting the coast from erosion. The Beninese government could invest in the promotion of beach tourism or recreation whilst introducing a flat-rate entry fee to access the spaces designed to guarantee their sustainability. Wherever possible and applicable, the government could work in partnership with the private sector and the local authorities for the design and implementation of an effective and efficient sustainable tourism management plan of coastal areas. The development of beach recreation and seaside tourism is likely to lead to the development of economic activities such as transport services, catering as demonstrated by Rigas (2009) in Iceland.

## Note

1. Calculated according to the exchange rate 1 USD = 586.71 XOF from January 07, 2020.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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