An Assessment of the Effect of Coastal Externalities on Residential Housing Prices in Badore, Lagos-Nigeria

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Abstract

The paper employed hedonic price model in the estimation of the effect of coastal externalities on the rental value of residential property in Badore community of Lagos, Nigeria. Previous investigations on coastal community property values particularly in the developed economies have revealed that, proximate residential property to coastline areas have presented a worthwhile value to investors across the globe with those residential properties fronting the coastline outperforming those with reasonable distance from the coastline zones. Intrigued by this finding, the current study therefore undertook its investigations from two dimensional perspectives which are to determine if a similar result exists for Badore community, a coastal area in Ibeju-Lekki local municipality of Lagos State. Data was collected from 256 structured questionnaires completed by household heads who are tenants within 500 meters of the coastline in the study area. Model 1A-C accounted for the influence of coastal amenities and other housing attributes on rent. Model 2A-C accounted for the effect of the interaction between coastal amenities/disamenities alongside other housing attributes on rent. The results suggest that for a mean-priced home (N224,846) at the mean distance from the coastline (282.96 m), a 1% increase in distance from the coastline would result in a 0.04%or N34.17 increase in rental value. When disamenity was controlled for in the entire- sample hedonic model, flooding further lower house rents in Badore by 0.12% (N94.56) for every 1% decreasing distance to the coastline.

***Keywords**: Coastal Externalities, Housing Attributes, Hedonic Modelling, Houses, Rent.*

1.0 Introduction

Globally, there are several reasons why people may desire to locate near the coast. In other words, the coastal area offers both physical and intangible benefits to households. These benefits include coastal view, cleaner air, cooler ambient temperatures, recreational resource, provision of job, means of transportation and tourism (Conroy and Milosch, 2011; Parker and Oates, 2016).

Simultaneously, there are disadvantages associated with living near the coast (Voice et al., 2006; Conroy and Milosch, 2011; Goussard, and Ducrocq, 2014). The drawbacks involve increased number of cloudy days, higher population densities, historically higher traffic congestion, storm and ocean surges (Conroy and Milosch, 2011; Adelekan, 2013). Despite the supposed hitches associated with coastal areas across the globe, it has been established that coastal shorelines are desirable locations by people to live in, Lagos coastal areas not an exception (Dada, 2009; Daniel et al., 2009; Below et al., 2015; Campbel, 2015). Furthermore, other earlier studies such as Bin and Kruse (2006) and Bin et al. (2009) have revealed that property values in coastal areas have been beneficial to investors across the world with the proximate properties to coastline performing better than those at rows behind as distance to the coastline increases.

The current study therefore assesses the effect of coastal externalities on residence from being located near the coastline while controlling for other important housing attributes in Badore Community, Lagos State. The remaining sections of this paper are organized as follows: section 2 reviews the literature concerning the effect of coastal externalities on property values. The study area and data are described in sections 3 and 4 respectively. The Methodology is explained in section 5. The empirical results are presented in Section 6. Finally, section 7 draws some conclusions from the analysis.

2.0 Literature Review

Coastal housing and property value modelling studies is a large field. The trend of discourse in the field in recent time has been devoted to the study and evaluation of the effect of coastal amenities and disamenities on property values. Bourassa et al. (2004) used 4,814 sales transactions to gauge the relative effects of 4 aesthetic externalities on property values in Auckland, New Zealand. The aesthetic externalities include several dimensions of view, appearance of landscapping in the neighbourhood, appearance of structures in the neighbourhood and appearance of immediately surrounding improvements. The authors found a hierarchy of impact with wide views of water earning the highest premium of 59% compared to average quality of the houses in the neighbourhood that commanded on average price premium of 37% and the average quality of the properties immediately surrounding the property in question earning premium of 27%. They found that poor-quality landscapping on average lowers property values by 51% while superior landscapping, though insignificant raises house price by approximately 10%. The authors concluded that aesthetic externalities are multidimensional and can have a substantial impact on residential property values.

In Victoria Garden City (VGC), Lagos, Udechukwu and Johnson (2010) utilized hedonic price model and t-test to compare the values of homes with and without lagoon view. They examined sales data from 83 occupiers of residential properties on disproportional basis, with 32 of the occupiers in lagoon view zone and remaining 51 occupiers in non-lagoon view zone. The t-test revealed that view adds significantly to the value of residential properties. The hedonic regression also confirmed the t-test result. The authors after controlling for the relevant determinants of property values concluded that home with a view commands a premium of 8% or N2.59 million naira more than homes without a view. Similarly, Makinde and Tokunboh (2013) employed hedonic pricing model to examine the impact of water view on sales transaction between February 2005 and March 2011 in VGC, Lagos, Nigeria and found that full view on average property increased the housing price by 47.9% when simultaneously controlled with other significant house price determinants.

Gordon et al. (2013) concentrated on condominium sales to account for externalities associated with their location. They used hedonic pricing model to analyse 1,051 sales along the Gulf Coast (Gulf Shores, Orange Beach, and Fort Morgan) of Alabama from 2006 to early 2011. They noted that positive externalities such as better views, increased privacy and noise reduction are associated with higher floor locations and capitalized into property values. Their hedonic model estimated that units on higher floors earned price premium of over 12% than ground level units while corner units sell at a premium of 3% over interior units.

Each of the studies (Bourassa et al., 2004; Udechukwu and Johnson, 2010; Makinde and Tokunboh, 2013; Gordon et al., 2013) that examined property value effect of water view has used generic definition of view (that is 'view' or 'no view') to measure amenities associated with coastline. Also, the studies did not account for the disamenities associated with the coastline. In this study, whilst controlling for coastal disamenity, the Euclidian linear distance from individual residential property to the nearest coastline was used which is an improvement over past studies that rely on the generic definition of view.

Posey and Rogers (2010) investigated 69,022 home sales prices in St. Louis County, Missouri. Their spatial hedonic model revealed a sales price discount of 8.6% for a home in special flood hazard areas (SFHA) compared to a home in non-special flood hazard areas (NSFHA). Their empirical study did not attempt to account for amenities associated with the rivers.

McKenzie and Levendis (2010) used hedonic price analysis to examine 9,001 homes sold 20 months prior to Hurricane Katrina of August 29, 2005 and 18 months after in greater New Orleans. Prior to Katrina, the authors found that waterfront properties in flood-prone areas commanded a premium of 14.3% while in areas not flooded, although not significant, waterfront properties commanded a premium of approximately 8%. They found that after Katrina, waterfront properties in flood prone areas commanded a premium of approximately 32% but a 24.1% premium if the property was not flooded. The authors concluded that houses that were flooded in Katrina displayed a lower sensitivity to future flood risk.

Yi and Choi (2020) examined the effect of actual inundation of the 2008 flood on single family detached residential properties sold between 2000 and 2012 for each level of flood risk area in Iowa, United States. The authors found that before the flood, property prices in 100-year floodplains without inundation declined by 20.4% indicating the reflection of flood risk in property values, but after the flood, there is no significant effect if floodplains were inundated while the prices of properties significantly increase by 28.4% if floodplains were not inundated during the flood. They found that in 500-year floodplains, the prices of properties before the flood, although insignificant declined by 6.7%, but after the flood, the prices of properties significantly decrease by 67.9% if floodplains were inundated while the prices of properties insignificantly declined by 4% if floodplains were not inundated during the flood. Their findings also revealed that house prices in non-floodplain areas decline by 4.8% if floodplains were inundated. The authors concluded that the inundation in non-floodplain areas and in 500-year floodplains is new information to the housing market, and the results can be interpreted as the market response to the updated flood risk.

The previous studies of McKenzie and Levendis (2010) and Yi and Choi (2020) have used floodplain locations as proxy for flooding to account for coastal disamenities. Daniel et al. (2009) declared that a floodplain location specifying dummy variable may misjudge the value of risk of flooding as existence of water is related to both negative and positive spatial amenities. Therefore, in this study, flood occurrence rate was used to account for coastal disamenities over the studies that rely on historical floodplain maps to account for coastal disamenities.

3.0 Study Area

Lagos State is a State in South-western part of Nigeria, bordering Ogun State in the North and East. Its Western border is defined by the Republic of Benin and in the South, it stretches for 180 kilometres along the coast of the Atlantic Ocean. Lagos State lies on Latitude 6˚27΄11˝N and Longitude 3˚23΄45˝E (Oteri and Ayeni, 2016).

Badore community is a growing settlement in Ibeju-Lekki local government area. Ibeju-Lekki LGA is bounded in the west and east by Eti-Osa and Epe local government areas while its southern end is defined by the Atlantic Ocean. The local government area is about 75 kilometres long and 20 kilometres at its widest point covering land and water areas of 643 km^2 and 10 km^2 respectively (Omenai and Ayodele, 2014; LBS, 2015). Figure 1 shows the map of the study area.

The area covered in this study with a cut-off of 500m to the coastline spans along the coastline covering Badore axis from Okun-Ajah, Badore to Okun-Mopo Akinlade/Mopo Alayo through to Okun-Mopo Ijebu Lekki. Okun-Ajah, Badore area of the axis is the most developed in terms of real estate market. The study area is home to many tribes but the Yorubas' are the populous. The area covered in this study with a cut-off of 500m to the coastline and stretch of 5.57 kilometres along the coastline, spanning from Prime beach through several other beaches to Redline leisure & resort down to Okun-Mapo, Ibeju Lekki.

4.0 Data

The residential property types vary across the communities on Badore axis. The predominant residential property types found and used for this study include tenement, two- and three-bedroom blocks of flats and bungalow. Taking a cue from Gopalakrishnan et al. (2009), the residential properties within 500m of the coastline was counted and the figure stands at 1,067. After ground-truthing, the physically identified rented residential properties within 500m of the coastline in the study area amounted to 284, which constituted the sample for the study. After data cleaning, 256 questionnaires were validly completed from the 284 tenants (Table 1). Out of the observations, 35.94% are within 250m of the coastline, while the remaining 64.06% are located between 251 and 500 m of the coastline.

The data extracted from questionnaire survey of these properties pertain to house rent, structural, locational, neighbourhood and environmental attributes. The data include house rent, building age, floor area, number of bedrooms, number of bathrooms, number of floors and presence of garage.

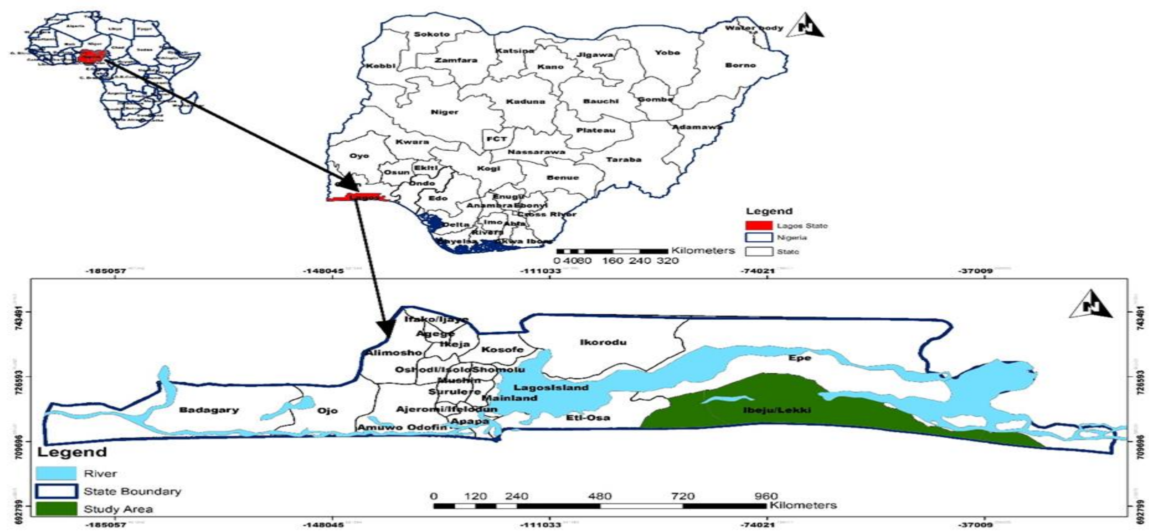

Figure 1: Map of the study area.

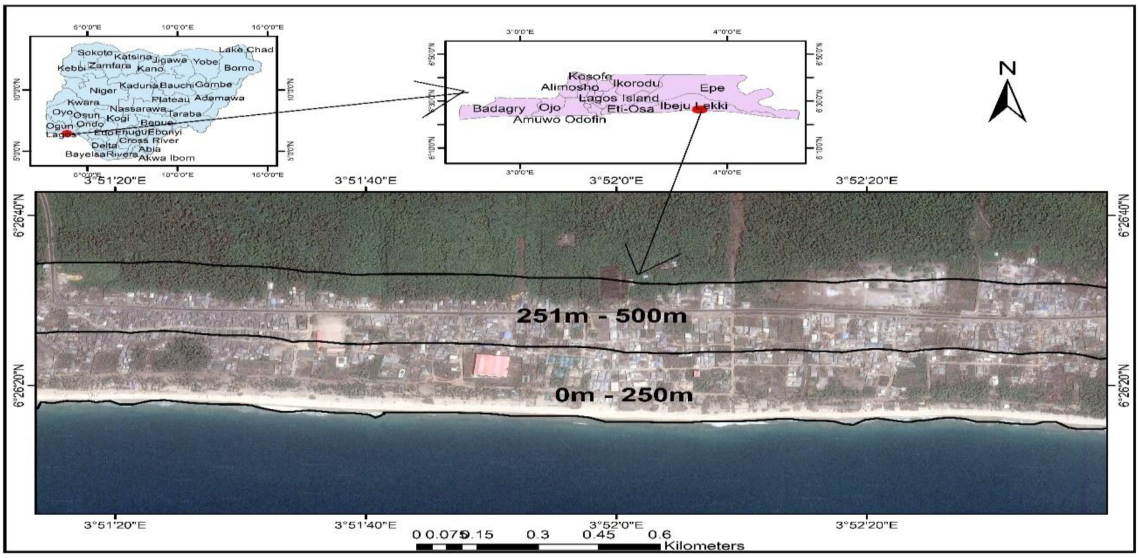

Figure 2: Map of the surveyed area with residential properties at an incremental distance of 250 m to Coastline.

Table 1: Questionnaire Administration

Distance to coastline	*Coastline stretch*	*Questionnaire Administered*	*Retrieved*	*Valid*
Within 250 m	*Residential buildings along Badore*	*102*	*95*	*92*
Between 251 & 500m	*Axis close to the Coastline from prime beach through several others to*	*182*	*170*	*164*
Total	*Redline leisure & resort down to Okun-Mapo, Ibeju Lekki*	*284*	*265*	*256*

Others are condition of building, landscape quality, distance of house to bus stop, distance of house to work place, distance of house to nearest coastline and rate of flood occurrence. Subsequently, the highly correlated variables namely building floor area, number of bedrooms and number of bathrooms are represented by the single variable number of bedrooms to avoid multi-collinearity problems in the hedonic models. The variables used, their definition and descriptive statistics are presented in Table 2.

As displayed in Table 2, the houses in the sample have a mean annual rent of about N 224,846 and the average house is over 13 years of age, with approximate 99 square metre of living space, 2 bedrooms, 2 bathrooms, and on 1 floor. An average property has an average distance of 282.96m from the coastline with rate of flood occurrence averaging 1.41 indicating low level. 14% of the properties have their external walls in excellent condition.

Table 2: Variables used, Definition and Descriptive Statistics

Variables	*Definition*	*Minimum*	*Maximum*	*Mean*	*Std. Dev*
RENT	*Rental price = dependent variable*	*12000*	*946000*	*224846*	*240049*
BLDAGE	*Age of Building*	*2*	*51*	*13.73*	*9.31*
BFLOAREA	*Floor Area of Building*	*30*	*240*	*98.57*	*64.67*
NBEDROOM	*Number of Bedroom*	*1*	*3*	*1.68*	*0.82*
NBATROOM	*Number of Bathroom*	*1*	*4*	*1.84*	*1.12*
NFLOORS	*Number of Floor*	*1*	*4*	*1.25*	*0.48*
GARAGE_YES	*1 if property has a garage, otherwise 0*	*0*	*1*	*0.42*	*0.49*
BLDCOND_Excellent	*1 if the condition of building is rated excellent, otherwise 0*	*0*	*1*	*0.14*	*0.35*
DISTWORK	*Distance to Workplace (in metre)*	*0*	*200000*	*19043*	*31250.82*
DISBSTOP	*Distance to Nearest Public Transport Bus stop (in metre)*	*12*	*2397*	*560.74*	*508.52*
DISTSCH	*Distance to Nearest School (in metre)*	*7*	*1373*	*339.52*	*357.99*
LSCAPQUA_Excellent	*1 if neigbourhood landscape quality is rated excellent, otherwise 0*	*0*	*1*	*0.08*	*0.27*
DISCOAST	*Distance to Nearest Coastline (in metre)*	*25.53*	*497*	*282.96*	*113.54*
FLODRATE	*Rate of flood occurrence in the last two years**	*1*	*3*	*1.41*	*0.78*

**An index was derived for measurement of flood rate and ranked as: 1=low (between 0-2 times) 2=medium (between 3-4 times) 3=high (more than 4 times)*

5.0 Methodology

The hedonic price models, estimated with the log-log functional form was used to analyse the data. The hedonic model takes the rental value of residential properties as the dependent variable, which is on ratio scale while the independent variables constitute housing attributes which are either on ratio scale or dichotomous dummy variable or interval scale. The log-log specifications for the hedonic price models bearing in mind model based on estimation of coastal amenity as captured by distance to the coastline and model based on the interaction of the coastal amenity with the flood occurrence are as shown in equations (1) and (2):

$$LogRENT = ß_0 + ß_1 logBLDAGE + ß_2 logBFLOAREA + ß_3 logDISTWORK + ß_4 logDISBSTOP + ß_5 logDISTSCH + ß_6 logDISCOAST + ß_7 NBEDROOM + ß_8 NBATROOM + ß_9 NFLOORS + ß_{10} GARAGE\_Yes + ß_{11} BLDCOND\_Excellent + ß_{12} LSCAPQUA\_Excellent + \varepsilon \quad (1)$$

$$LogRENT = ß_0 + ß_1 logBLDAGE + ß_2 logBFLOAREA + ß_3 logDISTWORK + ß_4 logDISBSTOP + ß_5 logDISTSCH + ß_6 log(DISCOAST*FLODRATE) + ß_7 NBEDROOM + ß_8 NBATROOM + ß_9 NFLOORS + ß_{10} GARAGE\_Yes + ß_{11} BLDCOND\_Excellent + ß_{12} LSCAPQUA\_Excellent + \varepsilon \quad (2)$$

Where rent is expressed in its natural logarithm, β_0 is a constant term, the coefficients $ß_1$ - $ß_6$ are the percentage change in rent resulting from a percentage change in age, building floor area, house-workplace distance, house-bus stop distance, house-school distance and house-nearest coastline distance (or interaction of distance to coastline and flood occurrence) respectively. The coefficients $ß_7$-$ß_{13}$ reveal the percentage change in rent of having additional bedroom, bathroom, floor and garage as well as for having building condition and neighbourhood landscape in excellent condition. The uncorrelated residual term is ε.

6.0 Empirical Results

The results of the hedonic models are presented in Table 3 and 4. The performances of the overall models for Badore are statistically robust with R-squared statistics ranging from 0.86 to 0.92. The models explain between 86% and 92% of the variance of rents in the study area. Following Field (2009) and Glen (2016), the Durbin-Watson statistics ranging from 1.748 to 1.985 for all the regression models which are close to 2.00 signify that there are no spatial correlations in the residuals of the estimated hedonic models.

The results reveal that of all the physical characteristic variables, number of bedrooms (NBEDROOM) is the most significant determinant of rental values. Across the models, number of bedrooms has positive coefficient and significant at the 0.1% level. The coefficient on NBEDROOM is large across all the 6 models, suggesting that an additional bedroom contributes a premium of between 68% and 76% to house rents. The coefficient estimates on the structural attribute for garage (GARAGE_YES) in models (1A), (1C), (2A) and (2C) is positive and significant but insignificant in model (2B). The results suggest that garage increases rental price by approximately 10% for properties up to 500 metres of the coastline while the attribute adds approximately 16% to the house rent in properties between 251 and 500 metres away from the coastline.

Regarding the location variables across the models, proximity to workplace and public transport bus stop increases house rent, whereas proximity to a school has a negative *influence. As the results show, decreasing the distance from home to workplace (LogDISTWORK) by 1% adds from 0.04% to 0.06% to the rental price. Similarly, decreasing the distance from home to public transport bus stop (LogDISBSTOP) by 1% increases house rent in a range of from 0.09% to 0.13%. In contrast, decreasing the distance from home to a school (LogDISTSCH) by 1% results in a decrease in house rent across the models by approximately 0.2%.*

*Moving on to the variable of interest, the coefficient for Log of distance to Coastline (LogDISCOAST) is positive but insignificant for model (1A). As the result show, a 1% increase in distance from the coastline leads to rise in property values by 0.04% which is equivalent to N34.17 when evaluated at the average house rent among homes up to 500 metres of the coastline. The result implies that distance to coastline has a weak effect on the rent of the properties with increasing returns. The coefficient on Log(DISCOAST*FLODRATE) in model (2A) indicates that when flooding becomes an issue, increasing the distance to the coastline by 1%, there is significant discount of about 0.12% associated with properties up to 500 metres of the coastline, equivalent to N94.56 when evaluated at the average house price. The result implies that when flooding is accounted for, proximity to the coastline is not desirable and increasing distance from the coastline has a strong positive impact on the property rents.*

Turning to the segmented models, without controlling for flood occurrence, among homes within 250 metres of the coastline (model 1B), the variable LogDISCOAST is negative but insignificant. The result implies that proximity to the coastline is fairly desirable and increasing distance from the coastline has weak negative effect on the house rent. As the result shows, a 1% increase in distance from the coastline is associated with a 0.004% or N3.47 decline in property rent. When flood occurrence is accounted for within 250 metres of the coastline, the sign and magnitude of the coefficient on Log(DISCOAST*FLODRATE) in model (2B) suggests that proximity to the coastline is not desirable and increasing distance from the coastline has weak positive effect on the house rents. To state this in a more concrete way, for every 1% increase in distance from the coastline, flooding increases house rent by N84.91 (0.098%).

The weak negative impact of the increasing distance from the coastline on the house rents in model 1B fizzles out in location between 251 and 500 metres away from the coastline (model 1C). Hence, in model (1C), increasing distance from the coastline results in a weak positive effect on the house rents. The result suggests that the location between 251 and 500 metres away from the coastline increases the house rent by 0.08% (N60.54) evaluated at the mean property value for every 1% increase in distance from the coastline. When flood occurrence becomes an issue in model (2C), increasing distance from the coastline results in a strong positive effect on the house rent. As the result shows, in location between 251 and 500 metres away from the coastline, flooding increases house rent significantly by 0.23% (N179.29) for every 1% increase in distance from the coastline.

7.0 Conclusion

The results presented in this paper suggest that proximity to coastline has weak negative effect on rent for properties within 500 metres of the coastline, though exert weak positive effect on rent for properties within 250 metres of the coastline. When coastal disamenities are controlled for, proximity to coastline has a strong negative effect on rent for properties within 500 metres of the coastline and by extension impact on house price. Generally, flooding, which constitute negative externality dampen rent by 0.12% (N94.56) within the study area. The result further signifies that house rents tend to increase with increasing distance from the coastline. The study recommends that coastal managers should adopt sound protection measures of the coastline in the study area. With this recommendation, it is hoped that the reflection of flood risk observed in house rents fronting the coastline will decline while rental values are likely to perform better. However, the result of this study is consistent with evidence provided in the psychology literature on general human behaviour (Below et al. 2015).

Table 3: Log-log Hedonic Price Models of Coastline and Housing Characteristics for Badore (Non-Flood Effect)

	Model 1A(0-500m)		Model 1B(0-250m)		Model 1C(251-500m)	
VARIABLES	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	3.953	18.184	4.037	8.265	3.856	8.906
LogBLDAGE	0.076	1.520	0.017	0.171	0.108	1.786
NBEDROOM	***0.540	26.929	***0.567	11.670	***0.521	23.146
NFLOORS	0.052	1.956	0.057	0.576	0.051	1.922
GARAGE_YES	**0.091	2.877	-0.009	-0.146	***0.147	3.778
BLDCOND_Excellent	0.029	0.708	0.039	0.358	0.016	0.362
LSCAPQUA_Excellent	0.001	0.012	0.032	0.299	-0.005	-0.083
LogDISCOAST	0.043	0.764	-0.004	-0.032	0.078	0.520
LogDISTWORK	***-0.063	-3.544	-0.046	-1.089	**-0.062	-3.135
LogDISBSTOP	***-0.129	-3.721	-0.116	-1.460	**-0.132	-3.456
LogDISTSCH	***0.199	5.946	**0.184	3.412	***0.196	4.246
R^2	**0.908**		**0.861**		**0.921**	
Adjusted R^2	**0.904**		**0.843**		**0.915**	
Standard Error (SE)	**0.171**		**0.198**		**0.157**	
Durbin-Watson	**1.854**		**1.985**		**1.781**	
F-Statistic	**238.094**		**47.799**		**177.235**	
p-Value	**0.000**		**0.000**		**0.000**	
Observations	**256**		**92**		**164**	

Dependent variable: LogRENT
**** indicates significance at the 0.1% (p<0.001) level*
*** indicates significance at the 1% (p<0.01) level*
** Indicates significance at the 5% (p<0.05) level*

Table 4: Log-log Hedonic Price Models of Coastline and Housing Characteristics for Badore (Flood Effect)

	Model 2A(0-500m)		Model 2B(0-250m)		Model 2C(251-500m)	
VARIABLES	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	3.782	19.520	3.751	8.415	3.545	13.496
LogBLDAGE	0.059	1.198	0.023	0.243	0.055	0.894
NBEDROOM	***0.534	26.733	***0.562	11.613	***0.514	23.234
NFLOORS	0.051	1.914	0.050	0.512	0.051	1.955
GARAGE_YES	**0.091	2.946	0.001	0.023	***0.144	3.828
BLDCOND_Excellent	0.002	0.037	-0.006	-0.047	-0.025	-0.546
LSCAPQUA_Excellent	-0.018	-0.371	0.023	0.217	-0.036	-0.652

*Log(DISCOAST*FLODRATE)*	**0.119*	*2.481*	*0.098*	*0.893*	**0.231*	*2.744*
LogDISTWORK	***-0.061*	*-3.481*	*-0.040*	*-0.960*	***-0.061*	*-3.169*
LogDISBSTOP	***-0.107*	*-3.119*	*-0.090*	*-1.138*	***-0.114*	*-3.056*
LogDISTSCH	****0.178*	*5.278*	***0.173*	*3.223*	****0.165*	*3.539*
R^2	***0.910***		***0.863***		***0.924***	
Adjusted R^2	***0.906***		***0.845***		***0.919***	
Standard Error (SE)	***0.169***		***0.197***		***0.154***	
Durbin-Watson	***1.819***		***1.942***		***1.748***	
F-Statistic	***244.138***		***48.374***		***186.354***	
p-Value	***0.000***		***0.000***		***0.000***	
Observations	***256***		***92***		***164***	

Dependent variable: LogRENT
**** indicates significance at the 0.1% (p<0.001) level*
*** indicates significance at the 1% (p<0.01) level*
** indicates significance at the 5% (p<0.05) level*

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