A STUDY ON THE SOCIO-ECONOMIC CONDITION OF A COMMUNITY BASED ON TOURISM IN KALAPARA UPAZILA

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ABSTRACT

Kuakata is located in Kalapara Upazila of Patuakhali District, Barisal division, and one of the major tourist destinations of Bangladesh. The goal of this research was to look into the socio-economic circumstances of Kalapara Upazila's five unions (Latachapli, Chakamaiya, Mohipur, Nilgonj, and Tiyakhali) as well as eight mouzas (Panjupara, Nishanbari, Nazidpur, Khaprabhanga, Shibpur, Nobipur, Nilgonj, and Badurtoli).



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Residents of the study locations were interviewed face-to-face to obtain the data and 64 residents of various ages and professions participated in this questionnaire-based study. The data collected was analyzed using Microsoft Excel and SPSS. The factors evaluated in this study to assess the socio-economic condition were employment, educational conditions, road and transportation conditions, local markets, medical and health care conditions, law and order, and tourism benefits of the local area. The findings show that the overall state of education, road and transportation, and medical facilities, all need to be improved and that more emphasis on these areas, as well as tourism development, should be provided. The purpose of this study was to offer a thorough picture of Kalapara Upazila's socio-economic situation and to make some recommendations for development in specific areas. More research in this area could yield more information.

Keywords: Kalapara, Kuakata, socioeconomic condition, education, ecotourism, occupation

1. Introduction

Kalapara (alternative spelling of Khepupara) is an Upazila in the Patuakhali district of Bangladesh's Barisal division. In 1921, Kalapara was regarded as a Thana. In 1983, it was converted into an Upazila. Kalapara Upazila is divided into Kalapara Municipality and Kuakata Municipality, as well as 12 union parishads: Baliatali, Chakamaia, Champapur, Dalbugonj, Dhankhali, Dulaser, Lalua, Latachapli, Mahipur, Mihagonj, Nilgonj, and Tiakhali. Further subdivisions of the union parishads include 58 mauzas and 239 settlements. Each municipality of Kuakata and Kalapara is split into nine wards. It has a population of 16330, with males constituting 55.18 percent and females constituting 44.82 percent. The population density is 838 people per square kilometre. The settlement has a total area of 19.49 km². The town's population has a literacy rate of 39.37 percent. There is just one cottage in the town. (Wikipedia)

Ecotourism has a plethora of economic benefits. There are effects in three forms: direct, indirect, and induced. From 2015 through 2025, global tourism and travel will increase their contribution to GDP (which is currently well above 10%) by a predicted 3.8 percent each year (Horaira,



2018). International tourists are projected to increase by 7.6 percent per year over this time, boosting total tourism GDP by 7.1 percent per year and employment by 1.8 percent per year (WTTC, 2017) Kuakata has been recognized as an ocean and coastal tourist destination (Hussain et al., (2017a)). The beach generates significant economic value via leisure and tourist services. The projected annual gross recreational benefit is Tk. 29.55 million. Additionally, it may offer value to local people's lives and socio-economic growth if the beach is developed further. Additionally, Bangladesh may generate foreign money by attracting many international tourists and domestic visitors to the location, which can be accomplished via sustainable development (Hossain & Islam, 2016).

Kalapara's population comprises farmers, fishers, and small business owners or shopkeepers, as is customary. Tourism attracts many visitors to Kalapara each year, and as a result, tiny enterprises and small stores abound in Kalapara, filled with tourism-related goods and souvenirs. Kalapara Upazila has a decent education degree, although literacy is not as high as it should be. Roads and transportation in Kalapara Upazila are other sources of worry. With less than half of the roads paved, it is difficult for residents to travel. Tourism was the primary factor that brought attention to Kalapara Upazila, owing to Kuakata, and the community readily acknowledges that tourism has been beneficial to the inhabitants.

With these considerations in mind, this research sought to ascertain the socio-economic circumstances of the ecotourism industry in Kuakata. The union-level data were collected from the Latachapli union in Panjupara village, the Chakamaiya union in Nishanbaria village, the Mohipur union in Mohipur and Nazibpur village in Shibbari village, the Nilgonj union in Nilgonj and Salimpur village in Nilgonj and Nabipur village, and the Tiyakhali union in Badortoli Badghat village in Badortoli Mouza. This research is being conducted to contribute to the ecotourism industry in Bangladesh by evaluating ecotourism in Kuakata from a variety of viewpoints to maximize Kuakata's potential as a high-demand ecotourism destination. Ecotourism has the potential to boost Bangladesh's economy significantly. It may be useful in enhancing a country's image and recognition on a global scale. As a result, this study is crucial.



2. LITERATURE REVIEW

Kuakata is situated in Kalapara, an Upazila of Patuakhali District in the Barisal division, and is a popular tourist attraction. Amtali Upazila bounds it on the north, The Bay of Bengal on the south, Rabnabad Channel and Galachipa Upazila on the east, Amtali Upazila on the west. The main rivers of Kalapara Upazila are the Andharmanik, Nilganj, and Dhankhali. Two important archaeological sites in this area are the Gautam Buddha statue at the Old Buddhist Bihara Keranipara (a giant Buddha statue in Asia) and the Buddhist Vihara of Kuakata. Kuakata, the country's second-largest tourist destination, is located in Upazila's southern part. (Kalapara Upazila, https://en.banglapedia.org/index.php)

Socioeconomic circumstances in a particular location are critical for a community or region to understand its demography. Numerous criteria may be used to describe a society's socioeconomic status. Among them include education, employment, and occupation of indigenous peoples, communication and transportation systems, health and medical care, access to essential commodities, and the flourishing of society's ideals.

After Cox's Bazar Beach, the Kuakata Sea Beach is a possible vacation and leisure destination in Bangladesh. The Kuakata Sea Beach has recreational value and is economically significant. Therefore, it is in desperate need of improved planning and administration. The beach generates significant economic value via leisure and tourist services. The projected annual gross recreational benefit is Tk. 29.55 million (Hossain & Islam, 2016). Additionally, if the beach is developed further, it may offer value to local people's lives and socioeconomic growth. Additionally, Bangladesh may generate foreign money by attracting many international tourists and domestic visitors to the location, which can be accomplished via sustainable development.

Economic analysis of tourism would need comprehensive data on pricing, tax revenues, tourist expenditures and expenditures by other sectors of the economy, prices for tourism and non-tourism goods, and arrival trends, among other things. Tourism has a diverse variety of economic effects. Tourism activities affect a region's revenue, sales, and employ-



ment. There are three types of effects: indirect, direct, and induced. The economic impact is defined as the sum of all indirect, direct, and induced impacts. The direct effect refers to the effects produced by changes in visitor spending. Due to the complexities inherent in quantifying tourism's economic impact, there is still considerable disagreement and contradictory data. Strong proponents of tourism believe that it benefits economies, particularly in developing nations such as Bangladesh. From 2015 through 2025, global tourism and travel will increase their contribution to GDP (which is currently well above 10%) by a predicted 3.8 percent each year. As incomes and the average age of the population increase in many countries and transportation costs decrease, seaside and coastal areas will become even more attractive tourist attractions. According to recent trends, Marine tourism will expand at a higher pace than foreign tourism as a whole (OECD, 2016). In Bangladesh, tourist investment is expected to increase at a projected 9.3 percent per year between 2018 and 2027. International tourists are projected to increase by 7.6 percent per year over this time, boosting total tourism GDP by 7.1 percent per year and employment by 1.8 percent per year (WTTC, 2017). Hussain et al. (2017a) selected Patenga Sea Beach, Cox's Bazar Sea Beach, Himsory and Inani Sea Beaches, St. Martin's Island, Moheshkhai Island, the Sundarbans Mangrove Forests, Kuakata Sea Beach, and Bhola and Manpura Islands as the ocean and coastal tourist destinations (Horaira, 2018).

3. METHODOLOGY

3.1. Study Area

To learn more about the socio-economic conditions in the research area, Kalapara Upazila, where locates Kuakata, a natural wonder and a popular tourist destination in Bangladesh, this study was performed. In the five unions of Kalapara Upazila, a cross-sectional study was undertaken to learn about the socio-economic condition, surrounding factors, and related features. Kalapara Upazila is located in the Patuakhali district of the Barishal division. According to the 2011 census report, the total population



of Kalapara Upazila is expected to be around 17492 people. It has a population of about 31324 people and a total area of 483.08 km². In Kalapara Upazila, there are 9 union parishads, 57 mouzas, and 247 villages. There are nine wards and 24 mahallas in Kalapara.

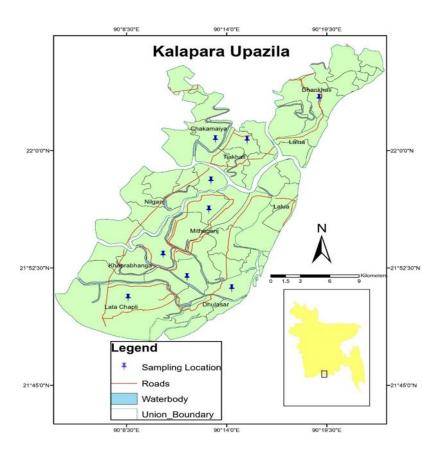


Figure 3.1. Study area map.

The total area of the settlement is 19.49 km². It has a population of approximately 16330 individuals, with men accounting for 55.18 percent and females for 44.82 percent. The population density is 838 people per square kilometer. Residents of the town have a literacy rate of 39.37 percent. The study region was chosen from the five unions of Kalapara Upazila. Latachapli, Chakamaiya, Mohipur, Nilgonj, and Tiyakhali are



their names. The data was taken from several villages in the various mouzas of the specified unions. Following that, the corresponding Department of Upazila officers gathered information about the research region. The GPS coordinates of the research regions were recorded and placed on a GIS map.

3.2. Study Procedure

The cross-sectional survey of 64 local inhabitants of different settlements from different mouzas was conducted in October 2020 by the Latachapli Union, Chakamaiya, Mohipur Union, Nilgonj Union, and Kalapara Upazila Tiyakhali Union, with the participation of 64 households from diverse occupations. For this study, data were collected for one week, from October 11 to October 15, 2020, using primary sources. Using a convenience sampling methodology, the sample was taken from five different villages in five different Kalapara Upazila Unions in the Barishal Division of Patuakhali district. To acquire information from the participants and to ensure sufficient precaution and geographic division, a face-to-face interview was conducted using a semi-structuring survey and informed agreement. Participants have to be over the age of 18 and live in the area in order to be considered. Individuals under the age of 18 who refused to participate in the survey were excluded. After their informed consent, 64 participants were questioned.

In the villages of Kalapara Upazila, these people were hired by several unions. The study's aims were explained to each responder so that they could understand why they were being asked to participate. Its personal information was captured when the survey was approved so that it could be validated during the data analysis. Interviews were conducted in Bengali, and all of the questions were thoroughly reviewed so that all of the questionnaire queries could be heard and debated. Each respondent's GPS co-ordinates for the interview site were recorded.



To conduct a pre-structured household survey, an open-ended and closed-ended questionnaire was created for each respondent. While the study region was being surveyed, individual discussions with the relevant Upazila officials were held. The casual meetings took place in their separate offices. This informal gathering took place at the Kalapara Upazila's office. Secondary data was acquired for this study before going to the study region.

3.3. Measures

During the interview sessions, data was collected using a questionnaire with five sections (cliched respondent information, initiate conditions, societal difficulties, environmental decline factors, and social and economic limits and suggestions).

3.4. Materials

ArcGIS 10.8, IBM SPSS (v 25), and Microsoft Excel were used to process the data. A GPS receiver was used to get the latitude and longitude readings. ArcGIS 10.8 was used to plot the study area's GPS site and display the sample site map as well as the study area's susceptible side. Prior to analysis, the data were processed using SPSS coding and summarizing software. According to the type of data, primary and secondary data were statistically and descriptively evaluated.

3.5. Statistical Analysis

A face-to-face interview and a survey questionnaire were used to gather data. For data processing and cleansing, the obtained data was sent to MS Excel. For descriptive data, SPSS was used to calculate frequency and percentage.



4. RESULTS

4.1. Socio-Demographic Information of the Respondents

Respondents were mostly male (70.3%). Majority of them were (28.13%) of them were aged between 26 to 35 years and then 20.31% were aged between 36-45 years. Most of the participants were married (79.7%) and had a variety of professions, housewives were the majority participants (26.56 percent) and 14.06% were farmer.

Table 4.1. Socio-demographic information of the respondents

	Frequency	Percentages
Gender		
Male	45	70.3
Female	19	29.7
Age		
18 or younger	8	12.5
19 – 25	8	12.5
26 – 35	18	28.13
36 – 45	13	20.31
46 – 55	9	14.06
56 – 65	5	7.81
65 or older	3	4.69
Marital status		
Unmarried	13	20.3
Married	51	79.7
Occupation of respondents		
Businessman/Land dealer	4	6.25
Teacher/Retired teacher	2	3.13
Village doctor	1	1.56
Mechanic	2	3.13
Tailor	1	1.56
Subcontractor/Day labor	2	3.13
Shopkeeper	7	10.94
Driver	4	6.25
Fisherman/Fish dealer	5	7.81
Farmer	9	14.06
Multi-professional	1	1.56
Housewife	17	26.56
Student	8	12.5
Unemployed	1	1.56



4.2. Major Occupations of the Local People

The respondents indicated that the people in the study area had occupation as farmers, fishermen, small businessmen and shopkeepers. Then, some of the locals were hotel businessmen, service holders, and baul accordingly based on the response rate of the respondents.

Table 4.2. Major occupations of the total population of the study area

Occupations	Frequency	Percentage
Farmer	64	100
Fisherman	64	100
Small businessman	63	98.44
Hotel businessman	8	12.5
Service holder	8	12.5
Shopkeeper	63	98.44
Baul	1	1.56

4.3. Education Condition of the Local Area

On average, the education rate of the study area was 44.73%, according to the information provided by respondents. There were 15 educational institutions in the whole study area according to the respondents. Most of the locals were educated at secondary level as 90.6% response indicated, whereas higher secondary level education was received by 9.4% of the locals. According to the respondents, educational institutions were not far from the locality. 62.5% of the participants said that schools were close to their locality. 37.5% response indicated that educational institutions were at a moderate proximity from their locality. According to the respondents, students (98.44%) were moderately regular in going to schools and none of the students were regular in going to schools.



Table 4.3. Education condition of the study area

Education	Frequency	Percentage
Secondary	58	90.6
Higher Secondary	6	9.4
Graduation	0	0
Distance of institutions		
Close	40	62.5
Moderate	24	37.5
Far	0	0
Type of school going		
Moderate	63	98.44
Rarely	1	1.56
Regular	0	0

4.4. Road and Transportation

50% of the respondents said that roads were paved in their locality and 42.2% said raw. 7.8% of the respondents asserted that roads were semi-paved in their locality. According to 68.75% of respondents, the transportation system was well. 29.69% response indicated moderate type of transportation system. The main transports of the study area were motorbike, van, auto-rickshaw, rickshaw, and bus accordingly to the response.

Table 4.4. Road and transportation of study area

Type of road	Frequency	Percentage
Paved road	32	50
Semi-paved road	5	7.8
Raw road	27	42.2
Transportation condition		
Very well	1	1.56
Well	44	68.75
Moderate	19	29.69
Worse	0	0
Types of transport		
Motorbike	64	100
Bus	2	3.13
Van	62	96.88
Auto rickshaw	53	82.81
Rickshaw	34	53.13



4.5. Markets in the Locality

According to all the respondents, the nearest markets are opened every day. All sorts of foods and groceries were available in the local markets.

Table 4.5. Type of things available in the market

Types of goods	Frequency	Percentage
Grocery	64	100
Fish	64	100
Meat	64	100
Vegetables	64	100
Fruits	63	98.44

4.6. Situation of Law

The majority of the respondents (85.94%) believed that situation of laws was well. Some respondents believed that situation of laws was moderate (12.5%). Rules and regulations were controlled and maintained by the local police and the village police equally.

Table 4.6. Situation of law and order in the study area

Situation	Frequency	Percentage
Very well	1	1.56
Well	55	85.94
Moderate	8	12.5
Worse	0	0
Law and order authority		
Village police	32	50
Local police	32	50



4.7. Medical Facility

On an average, locals went to 2 medical centers which provide medical facility according to respondents. According to the respondents, medical centers were in moderate distance from their locality. Most of the respondents (43.8%) said that they went to Tulatuli medical center which was situated at Mohipur while others went to other places for treatment. According to all respondents, all people (64 out of 64, 100%) are treated and prescribed by medical officers.

Table 4.7. Distance of medical center from the locality

Distance	Frequency	Percentage
Close	10	15.63
Moderate	54	84.37
Far	0	0
Places of treatment		
Tulatuli (Mohipur)	28	43.8
Chungabasha	8	12.5
Pakhimara (Faridganj)	17	26.6
Gazibari (Itabari)	11	17.1

4.8. Benefits from Tourist Arrival

95.31% of the locals stated that tourism was beneficial for the local area. Economic growth, business improvement, creating employment opportunities, earning foreign currency and several other benefits were mentioned by the respondents.



Table 4.8. Benefits of tourist arrival

Tourism beneficial	Frequency	Percentage
Yes	61	95.31
No	3	4.69
Benefits from tourism		
Business improvement	60	93.75
Creating employment opportunity	59	92.19
Increasing familiarity of the area	43	67.19
Earning foreign currency	57	89.06
Improving communication system	28	43.75

5. DISCUSSION

Socio-economic conditions of a certain area are a very important aspect for a society or area to know the demographics of the locality. Several parameters can define the condition of socio-economic situation for a society. Some of these are education, employment and occupation of the locals, communication system and transportation, health and medical situation, availability of daily commodities and flourishment of society's values. This study collected the above-mentioned parameters' information of Kalapara Upazila, except for goodwill of a society.

People in Kalapara are mostly farmers, fishermen and small businessmen or shopkeepers, which follows the usual trend. As Bangladesh is an agricultural country, anywhere in this country, farmers are majority. Kalapara being on the shore of the Bay of Bengal, it is common that there would be many fishermen there. Tourism pulls many people to visit Kalapara every year and so, small businesses and little shops are in huge numbers in Kalapara, full of tourism-related products and souvenirs. The education level in Kalapara Upazila is moderate but literacy is not as high as it should have been. There were no graduates in the area as informed. Only 15 educational institutions were found there which is not enough for an Upazila, although these seem to be in close proximity of the locality. It is also alarming that none of the students is regular in attending schools. Road and transportation in Kalapara Upazila are other issues to be



concerned with only half of the roads paved, it is problematic for people to commute easily. The transportation system and the condition is reported to be good and people generally travel by rickshaws, autorickshaws and bikes. But for a tourist spot, there had to be some established modes of transportation.

Markets in Kalapara are adequate for daily commodities and have enough amounts of food, groceries, vegetables and fish. Medicals are moderately close there, not very near to hand and people generally know of two medical facilities averages where treatment are given. Medical facilities may draw a concern of the authorities to provide better healthcare. Law and order in this area, however, is good, thanks to proper surveillance and control of local police and village police. Tourism is the principal thing that drew attention towards Kalapara Upazila, due to Kuakata and people duly accepts the fact that tourism has been really beneficial for the locals. They have been maintaining the sectors where they have been gaining much because of tourism. Small businesses, pawn shops, souvenir shops, hotel-motel, restaurants and tour guidance have seen well business happening.

CONCLUSION

This study was concerned about five unions of Kalapara Upazila, under which Kuakata is located. Because of its natural, cultural and historical significance, Kuakata is one of the Bangladesh's most popular tourist destinations. It is primarily a tourist destination that attracts locals as well as visitors from all over the world, and so, Kalapara welcomes many visitors yearly. As a tourism spot like this can open new doors of opportunities for an area, several points still must be checked beforehand. The socio-economic condition of people living in a place like this must get the proper benefit and with that, their lifestyle must improve. People should be more involved in tourism in this area to bolster the tourism situation and they should get proper guidance and support from the authorities for that reason. Education must become easier to attain and



children must learn. The communication system should thoroughly become convenient as tourist places should be easily commutable. Otherwise, the place will lose its attraction. The medical facilities should be reliable to the people and that will make things better for them. This place remains in constant threat of many natural disasters and that is why medical facilities must be closed and well known to people. If the conditions of the local people are improved, all the underlying situations will recover and grow. Then, Kalapara Upazila will be capable of pulling more and more visitors every year. In this study, the sample size was small. This means that the sample size needs to be improved. In order to determine whether the factors studied have improved or not, more research is needed. Opportunities are there for further research in this field.

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REFERENCES

- Alam, M. Z., Halsey, J., Haque, M. M., Talukdar, M., Moniruzzaman, M., & R. Crump, A. (2018). Effect of Natural Disasters and Their Coping Strategies in the Kuakata Coastal Belt of Patuakhali Bangladesh. *Computational Water, Energy, and Environmental Engineering*, 07 (04), 161–182. https://doi.org/10.4236/cweee.2018.74011.
- BBS. (2014). Population & Housing Census-2011. *Bangladesh Bureau of Statistics*, 2, 163–164.
- Horaira, M. A. (2018). Tourism in Kuakata: A Curbed Rareness in Global Village. *American Journal of Trade and Policy*, *5*(2), 67–72. https://doi.org/10.18034/ajtp.v5i2.436.



- Horaira, M. A. (2020). The Economic Impact of Tourism on to the Community of Kuakata. *Asian Journal of Humanity, Art and Literature*, 7(1), 43–58. https://doi.org/10.18034/ajhal.v7i1.500.
- Hossain, S., & Islam, N. (2014). Estimating Recreational Benefits of the Kuakata Sea Beach: A Travel Cost Analysis. *European Journal of Sustainable Development*, *3*(2), 119–132. https://doi.org/10.14207/ejsd.2014.v3n2p119.
- Lipy, N. S. (2015). Exploratory Analysis of Tourist Satisfaction Level on Tourism Goods and Services of Kuakata and Department of Management Studies.
- Kalapara Upazila. (2020), Retrieved March 26, 2021, from Wikipedia: https://en.wikipedia.org/wiki/Kalapara_Upazila.
- Kalapara Upazila. (2020), Retrieved March 26, 2021, from Banglapedia: https://en.banglapedia.org/index.php/Kalapara_Upazila
- Kuakata. (2020), Retrieved March 26, 2021, from Wikipedia: https://en.wikipedia.org/wiki/Kuakata.
- Kuakata (2020), Retrieved March 26, 2021, from Banglapedia: https://en.banglapedia.org/index.php/Kuakata.
- Mozumder, M. M. H., Uddin, M. M., Schneider, P., Islam, M. M., & Shamsuzzaman, M. M. (2018). Fisheries-based ecotourism in Bangladesh: Potentials and challenges. *Resources*, 7(4), 1–18. https://doi.org/10.3390/resources7040061.
- Nobi, M. N., & Majumder, M. A. (2019). Coastal and marine tourism in the future. *Journal of Ocean and Coastal Economics*, 6(2). https://doi.org/10.15351/2373-8456.1101.
- Rashid, M. M., & Taskin, R. (2018). Tourism in Kuakata, Bangladesh: Understanding Current Status and Future Prospects. *Ottoman Journal of Tourism and Management Research*, *3*(1), 235–244. https://doi.org/10.26465/ojtmr.2018319507.
- Takeuchi, H., Taki, Y., Nouchi, R., Yokoyama, R., Kotozaki, Y., Nakagawa, S., Sekiguchi, A., Iizuka, K., Yamamoto, Y., Hanawa, S., Araki, T., Miyauchi, C. M., Sakaki, K., Nozawa, T., Ikeda, S., Yokota, S., Magistro, D., Sassa, Y., & Kawashima, R. (2019). The Effects of Family Socioeconomic Status on Psychological and Neural



Mechanisms as Well as Their Sex Differences. *Frontiers in Human Neuroscience*, 12(January), 1–18. https://doi.org/10.3389/fnhum.2018. 00543.

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