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A Model for Accommodation Selection using GIS and Multi-Criteria System

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Abstract

The main purpose of this research to develop a preference model for the best accommodation selection process in Chittagong city, Bangladesh based on College, Market, Hospital and Park with GIS and Multi-Criteria System (MCS). A decision is the result of a comparison of one or more alternatives concerning one or more criteria that we considered relevant for the task at hand. MCS is primarily concerned with how to combine the information from Multi- Criteria to form a single index of evaluation. Multi-Criteria System (MCS) provides a more logical and scientific way for best accommodation selection. MCS describes any structured approach used to determine overall preferences among alternative options, where accomplish several criteria .The results were having a sample of the computerized program that could be used to measure these indicators and their weights. The integration of multi-criteria evaluation (MCE) and multi-criteria decision making (MCDM) techniques with the Geographical information system (GIS) are forward as providing the user with the means to evaluate various alternatives by multiple and collecting criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Mosjid, Mondir, Temple, Playground, Airport and Police station. There is a most important option is weight. The weights for the multi-criteria system obtained from the multiple criteria. For a selection of the best suitable location for accommodation, there were a lot of elements that should take into some consideration. The people who want to live in this location which provides their own facility in Chittagong city, Bangladesh they can search their best accommodation by this work. So, people must save their time to get an appropriate location for this work. So, as a result, the select a best accommodation considered by the multi-criteria. The research work has been done based on some development area of Chittagong city in Bangladesh.

Index terms—

1 I. introduction

hittagong city is placed closer to the south-east of the Capital metropolis of Dhaka that's around 280Km. from the capital. Chittagong city situated at the bank of Karnaphully River, and surrounded by way of natural resources just like the green Hilly Terrain and the Bay of Bengal on the west. This place located in Chittagong Zl, Chittagong Div, Bangladesh, its geographical coordinates are 22° 21' forty-nine" North, ninety-one° forty-eight' 12" East and its unique name (with diacritics) is Chittagong. Chittagong is the second one largest city, prime Sea Port and the heart of all commercial and business activities in Bangladesh. Thus, the government of the United States of America has already declared Chittagong because of the "industrial Capital" of the USA through this time. After the independence of Bangladesh in 1971, Chittagong has earned a considerable of the second vital town because of the Chittagong Port, monetary sports, academic institution, natural Beauties, commercial activities and due to its suitable Geographical region aspect within the local Map.

Best accommodation selection is one of the vital decisions in the start-up process because it's one of the most important elements for living. It has become challenging because limited infrastructure and resource with depending on the multiple criteria. Therefore, Multicriteria system is a framework for important step of the rational decision-making process. The purpose of the evaluation is to gain reliable information or some criteria weaknesses, on strengths and overall utility of each option of multi-criteria. Multi-criteria system is a crucial decision making skill the process of evaluation is often poorly organized or even omitted.

In a location selection method, the analyst strives to decide the top of the line region that could fulfill the selection standards. The selection process tries to optimize some goals preferred for a selected facility. Such optimization frequently entails numerous selection factors, that are often contradicting, and frequently includes some of the viable location each has benefits and boundaries. Multi-criteria system strategies about house place usually contain the assessment of more than one criteria in line with numerous, frequently conflicting, goals. At the same time as many decisions we make are brought on by using a single goal, it also takes place that we need to make decisions that fulfill several options. These goals can be complementary or conflicting. The select region for lodging is a systematic method that is used to formalize the priorities and the developmental targets for the geographical location **??**Dodgson et al. 2009).

Geographic information systems (GIS) are a Herculean tool designed for spatial analysis which presents functionality by capture, store, query, analyze, show or yield geographic information. Geographic information systems used in an alliance with different systems yet some other methods for example as much structures for multi-criteria assessment (MCE) or the approach for multi-criteria decision making (MCDM). The Synergistic effect, generated via combining these equipment contributes to the effectivity then virtue concerning spatial analysis because of adapt selection. As a certain, that bear substantial effect within spatial selection construction process. Recent improvement into discipline concerning selection erection leads after arresting into the capabilities over GIS between area analyses. These development are reviewed thru over quality statistics especially processes for Multi-Criteria and Multi-Objective place analysis in GIS. The issues on incorporating subjective impact in the adherence about selection making; the issue of uncertainty of establishing the relationship among evidence then the choice in conformity with stand made; methods for the quantity about proof among the arrival of various tiers about trade-off of criteria; yet techniques because struggle decision and fighting death within cases regarding multiple objective choice problems (Aleksandar Rikalovic*, Ilija Cosic, Djordje Lazarevic 2014). Therefore, development projects every so often focused on unneeded geographical zones while not having a clear framework which might be primarily based on analyzing all Multi-criteria of appropriate vicinity in term of region rank, to be had resources, current developmental projects, standards rates, criteria significance and all associated Multi-criteria that ought to be considered whilst developmental model.

2 a) The Scope of the Research

Accommodation is a fundamental component for life. As the living styles have changed from ages to ages everybody, the way of having fun for people in their leisure times have changed. When people need to move from one location to another locations, they want to get some specific facilities which directly involved with human life so that they felling comfortable at this location. But sometimes it is difficult for some people to decide which one is better from another location and available all the facilities which they need. The Most important reason is they have to consider many factors of that location. So we have tried to making a process so that people could find out their best area and get all facilities. This research model has many criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Masjid, Mondir, Temple, Playground, Airport and Police station. People can select the criteria based on importance. But we selected only four criteria to test the research model result. This research helps the finding an accommodation for alive.

3 b) Problem Statement

Chittagong city is one of the second largest city in Bangladesh. It is known as the business city of Bangladesh. Therefore, people from the surrounding areas migrated into the city in a better life, search of employment, study and business. Also, the most important thing is the accommodation for these people. Everybody tries to find out a suitable location for their accommodations. But the town was once no longer prepared in conformity with agree on it more population into the towns together with its urban facilities within a little goblin concerning time. As a result, a lot about urban environmental problems arose in the city. Recently many locations of Chittagong city developed with modern facilities. People want to live in the area which is consisting of more facilities. This research has many criteria. These criteria are Market, Office, Rood, Park, Sea beach, Hospital, University, College, School, Masjid, Mondir, Temple, Playground, Airport and Police station. People can select the criteria based on importance. However, it is tedious and time-consuming to choice the best area to living.

4 c) Research Questions

After successfully processing data, a thematic result was generated to provide a solution of the following research questions: Question No 1: How to combine GIS, Google map, and Multi-Criteria System to decision making for preference model? Question No 2: What are the most important criteria for development model and how to

select it? Question No 3: How to use DSS to select the best location in the different residential area for preference model?

5 d) Research aim and objectives

The aim of this research is to develop a framework model for assisting the decision maker's technique to prioritize of accommodation selection process based on some important criteria in the residential area of Chittagong city. Within this broad aim, the research has three objectives-Objective 1: To study geographical information system, geographical location, and Google map to assist the Multi-Criteria system for decision making, and developing accommodation selection model. Objective 2: To propose a preference model for accommodation selection process using a multi-criteria system based on some important criteria.

Objective 3: To evaluate the suitable location for accommodation based on decision support system in the different residential area in this city.

6 II. The Algorithm of Mces with Gl

Based Conceptual Framework The maximum distance score is 0, the minimum distance score is 1, and another value is divided by the minimum distance score (Carver, 1991). Weight adjustment: Allocation weighted of each criterion. It's done to adding weight to reflect the importance of each criteria. The allocated of weights each criterion separately. Weights allocated which the relative importance of the client. Result: Finally, add the criteria score. An MCE method may then multiply the standardized scores by the weights for each of the data layers in stage 1 and sum these to allocate a score to each pixel on the output map. Further evaluation of the results may be carried out by ranking the values in the results map and reclassifying the map to show the top score objectively. This objective indicates the best one.

7 a) Criteria determination

The elements all time need our day to day life. There different types of criteria we need in our life. Criterion like this, institution (School, College, and University) for increase our knowledge with buildup our career, Hospital for taking treatment for good health, park for taken entertainments, Mosque for prayer, Market for buy and sales food, clothes and other things. The main advantage of this procedure is its simplicity since the weighting of criteria takes place before the utilized of the model, so that once the weighting of the different criteria established, the analyst may proceed towards the solution of the problem. In discrete Multi-Criteria system problems, there are several procedures aims at obtaining the decision-makers priorities in the form of weights. For the accommodation selection in Chittagong city, there were a lot of elements that should take into consideration. According to various factors, there were main aspects to be considered. Some of them given belowi. College Education holds the keys to your child's future. It's can help your child reach his/her life goals, aims and dreams. Its will helps your child choose what he/she wants in their life. A Good education is essential to setting up children to better handle the rest of their lives, so the importance of good schools cannot over stated. Most important is School, College, University are less distance from the area. Then go to school, college and university. With an education, your child has more options, which often lead to greater success and happiness in life.

ii. Market The Market is one of the most usual elements in life. A market defines as the total of all the buyers and sellers' food, clothes with other things in the area or region under consideration. The value, prices and cost of items traded are as per forces of supply and demand in a market. The market may be a physical entity or may be virtual. It may be local or global, perfect and imperfect. Market should be near to your accommodation is more important, because buy and sales anything easily spent less time.

iii. Hospital A hospital is a health care institution providing patient treatment with nursing staff, specialized medical and, medical equipment. Healthcare facilities are essential at any stage in life, but they are especially relevant or if you are nearing retirement age, either if you have children. Easy access to healthcare can increase your quality of life exponentially, so be on the lookout for towns and cities with good hospitals and medical schools. Specialized hospitals can help reduce health care costs compared to general hospitals. So, should be accommodation selection is must be near to accommodation from the hospital. iv. Park Parks are places for people to enjoy and relax. There are lots of things to do such as mountaineering, taking photographs, enjoying the view, taking in the fresh air swimming, skiing, and painting. Some parks are built adjacent to bodies of water or watercourses and may comprise a beach or boat dock area. The Park around the accommodation area is more recreational for good health and mode of relaxations. Parks are places for everybody to learn about animals and the way they rely on each other and native plants. So, the park is another important criteria in our life.

8 b) Weight Adjustment

Weight adjustment is important factor for this research. It's effective for single decision making, and group decision making. It's works well for single decision making because it forces you to get clarity on your important criteria. It works well for group decision making because you create a shared set of criterion. When people know what's valued, it's easier to understand and weight in on the decisions. It's also a way to find out mismatches in expectations. For example, if one person thinks College most important factor but another thinks the hospital is more important, you can have a conversation around the usage scenarios and trade-offs and share perspectives

things. The other beauty of using criterion and weight is that it helps make the issue less subjective, so that you can have a less defensive and more objective evaluation of the options. In this case, 0 is less important, 1 is more important and another is between 0 and 1.

At this stage, the decision maker's preferences concerning the evaluation criteria incorporated into the decision model. They are typically express regarding the weights of relative importance assigned to the evaluation criteria under consideration. The purpose of criterion weights is to express the importance of each criterion relative to other criteria.

Weight allocation each criterion particularly essential for people because weight allocation is criteria basis. Let suppose; you are an employer. If your office near your house. Then you have saved time, save fare money. So, you have the most important criteria office, and then you can put the weight very extreme importance 1 or 0.9, 0.8. Priority-based user weight list shows the table 2.1.

9 III. Result and Discussion

A set of conceptual steps were used to build the conceptual model of the thesis. In order to recognize the sequence of steps. The conceptual framework will mainly focus on the establishment concept and producers of the GL based Multi-Criteria having been finding appropriate locations for accommodation.

10 a) Implementation of the GL-Based Multi-Criteria conceptual framework for accommodation selection process

In the following section, the conceptual GL based Multi-Criteria evaluation system will be illustrated to show the prioritization of accommodation selection process in Chittagong city, Bangladesh.

Select some suitable location in Chittagong city which location provides some facility of accommodation selection. Chittagong is land on natural beauty, like Virgin Hilly region, the Bay of Bengal and the Karnaphuly River. These beautiful natural geographical location features can potentially developed with the select suitable accommodation for the living. There facilities, which can attract local as well as foreign people in the city and surrounding areas. Now, taken some location for accommodation selection process in Chittagong city, some selected location shows the table 3.1.

11 Table 3.1: Selected location name c) Criteria determination

Criteria are the elements which are all time need our day to day life. There different types of criteria we need for our life. Criteria like this, institution (School, College, and University) for increase our knowledge with buildup our career, Hospital for taking treatment for good health, park for taken entertainments, Mosque for prayer, Market for buy and selling food, clothes and other things. Here selected four most important criteria for implementation of this research. This criteria shows the table 3.2.

12 Table 3.2: Selected criteria name d) Scaling

Scaling is the procedure of assigning the objects and measuring to the numbers according to the specified rules. In other words, the process of locating the measured objects on the distance, a continuous sequence of numbers to which the objects are assigned. This research uses the scaling for measurement to the distance each location to criteria. These research the scaling distance measurement by the Google map at the location to criteria distance.

13 e) Assign the standardization score

The standardization score (more commonly referred to as a z-score) is a very useful statistic because it allows us to calculate the probability of a score occurring within our normal distribution and enables us to compare two scores (0 and 1) and that are from different normal distributions. Standardization of criterion scores particularly assigns the value. The standardization of criteria scores evaluating way.

So, all the value defined between two intervals scores 0 and 1. The maximum scaling distance is score 0; the minimum scaling distance is score 1, find out the other value is divided by minimum criteria value. Assign the standardization score all location with their criteria (College, Market, Hospital, and Park) together shows the table 3 As a result, we consider four locations (Bahadarhat bazar, Jamal Khan, and Chandgon residential area and Muradpur cir) and four criteria (College, Hospital, Market, and Park) for test the result for preference model. After that, we took the scaling distance from the location to criteria. Then we got the standardization score followed by Multi-Criteria System technique and multiplies standardization score and weight. Then we got each the criteria score. After that add all criteria score for each location. So, reviewed above the table **??**3.11)

14 IV. Conclusion

The research visualized a conceptual framework based on a systemic approach in geographical location for accommodation selection process. This research has presented a GIS and GL-based multi-criteria analysis approach to assess suitable location for accommodation selection process. The proposed accommodation selection process was score based on the results, according to the highest score were ranked one, second highest score was

ranked two, and third highest score was ranked three. So, this thesis result depends on the systematically. The conceptual framework comprised of four steps: establishment of weighting suitability criteria, analysis the geographical location of Chittagong city, the establishment of the Multi-Criteria weights and evaluation criteria, and location selection. An integrated system was developed to aid the analyst in finding the optimum location for the facility sought. The system integrated three tools GIS, Google Map and Multi-Criteria evaluation system in a manner that attains the correct solution to assist the decision makers in extracting appropriate weights for the physical suitability criteria. By this research, any client searches the best location in Chittagong city area based on multiple criteria. So I think this research helps easily finds a good location for accommodation for a client.

15 Future work

This research work was done only one city based on some development area in Bangladesh. In future follow this research a researcher will be prepared for all cities in Bangladesh or any city or any country. It is recommended to activate the usage of the computerized model to be uploaded into online access database linked with GL and Multi-Criteria analysis. [1]

11

Figure 1: Figure 1 . 1 :

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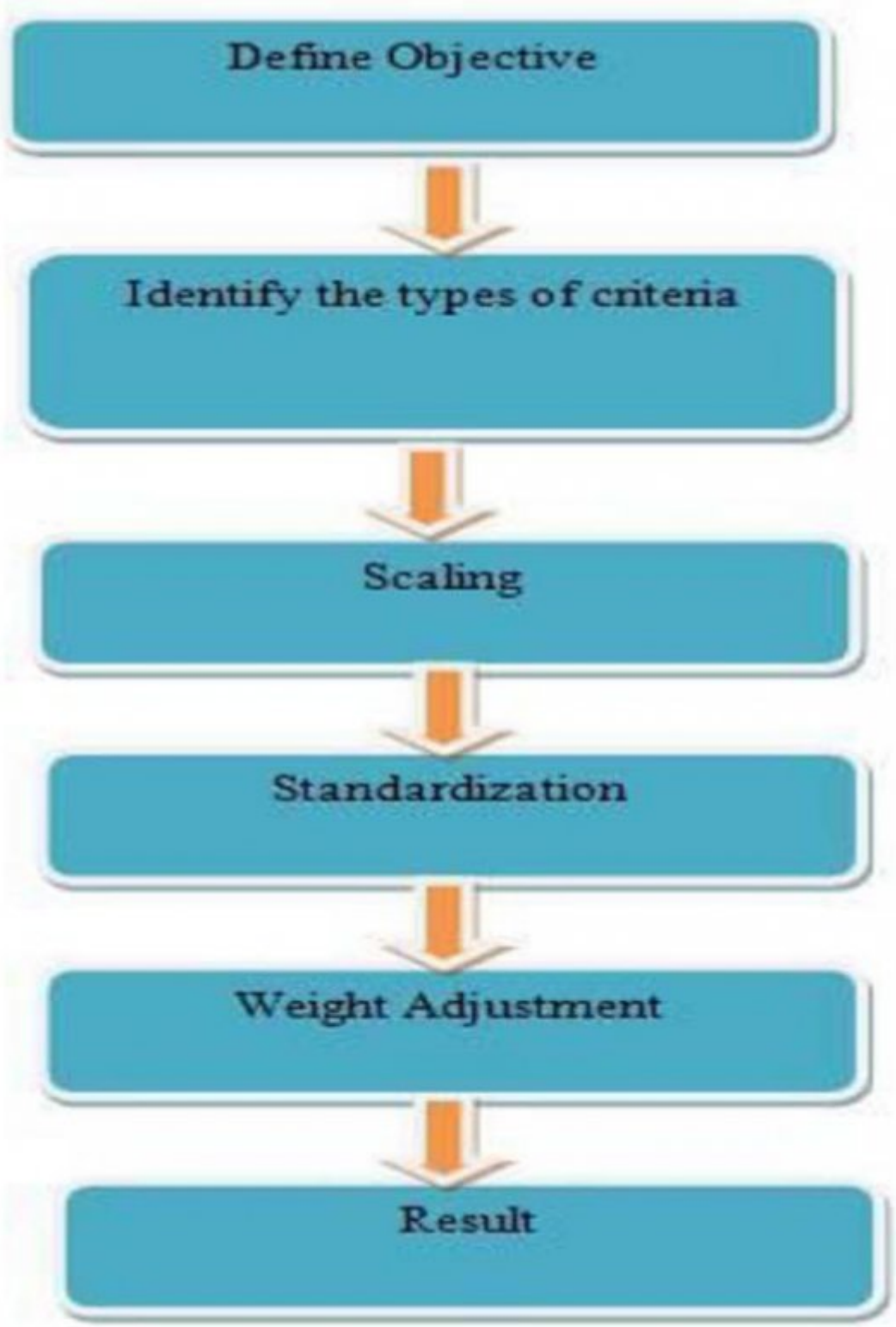
Define Objective
Identify the types of criteria
Scaling
Standardization
Weight Adjustment
Result

Figure 2:

21

Figure 3: Figure. 2 . 1 :

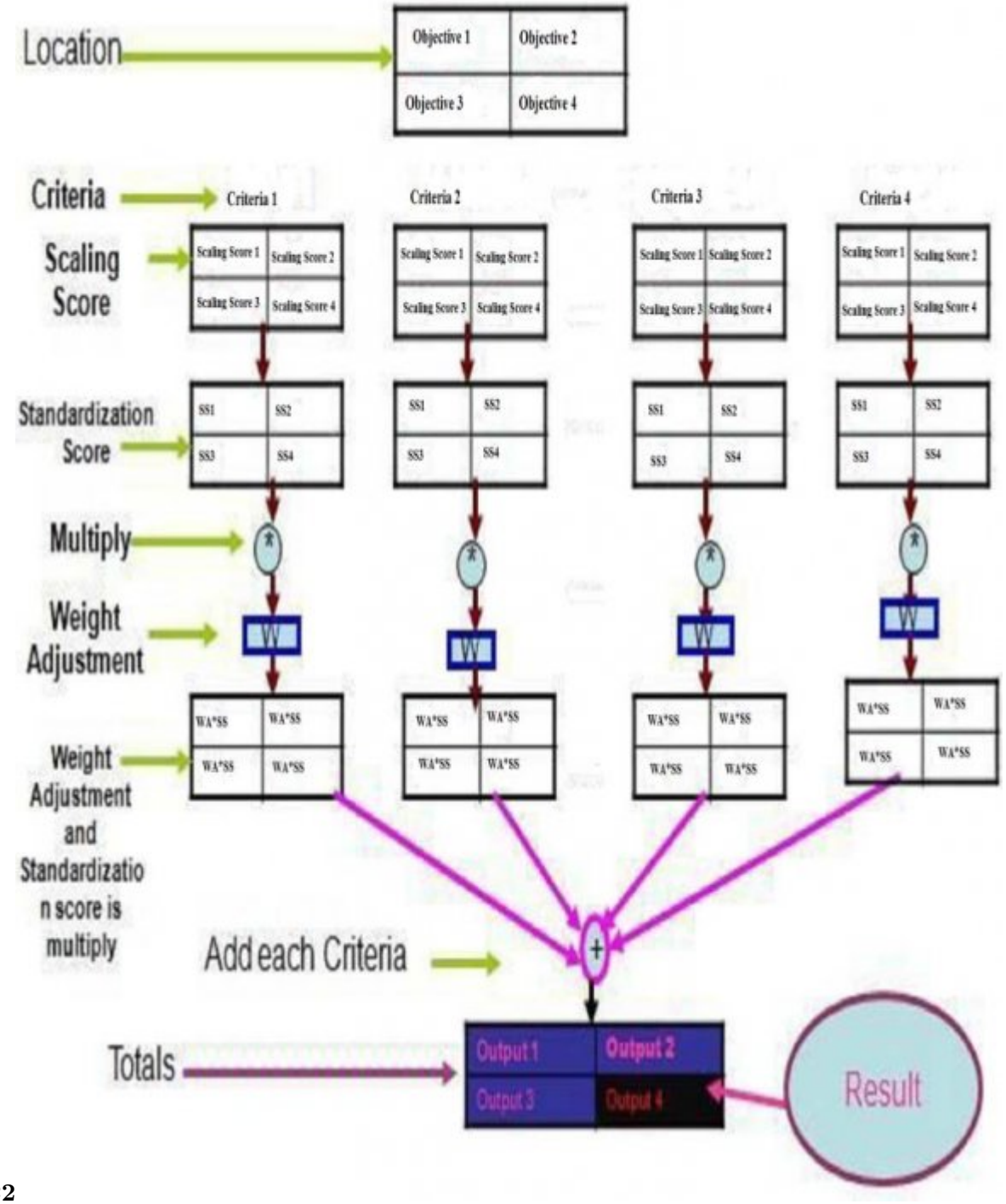

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Figure 4: Figure 2 . 2 :

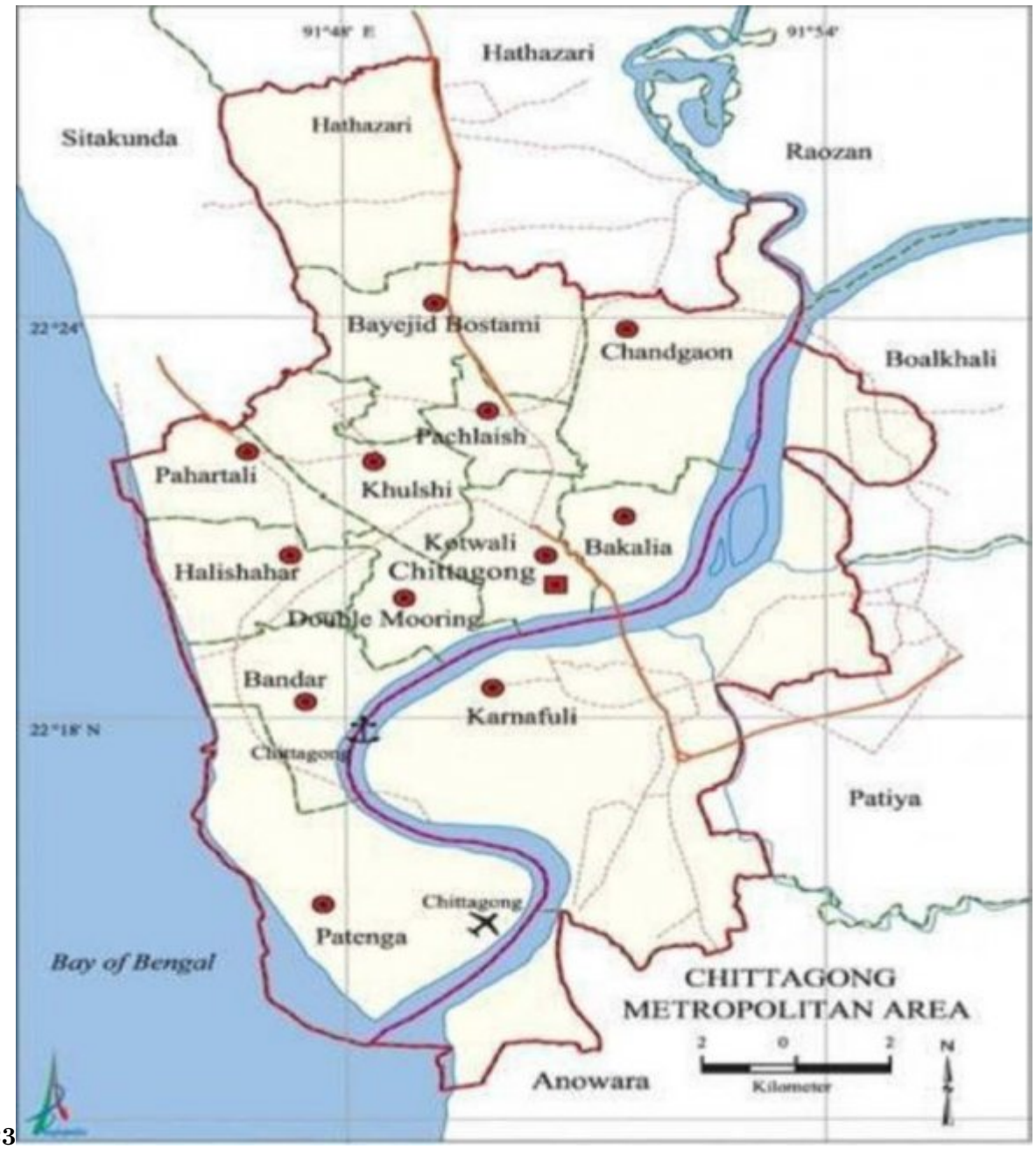


Figure 5: Figure 2 . 3 :

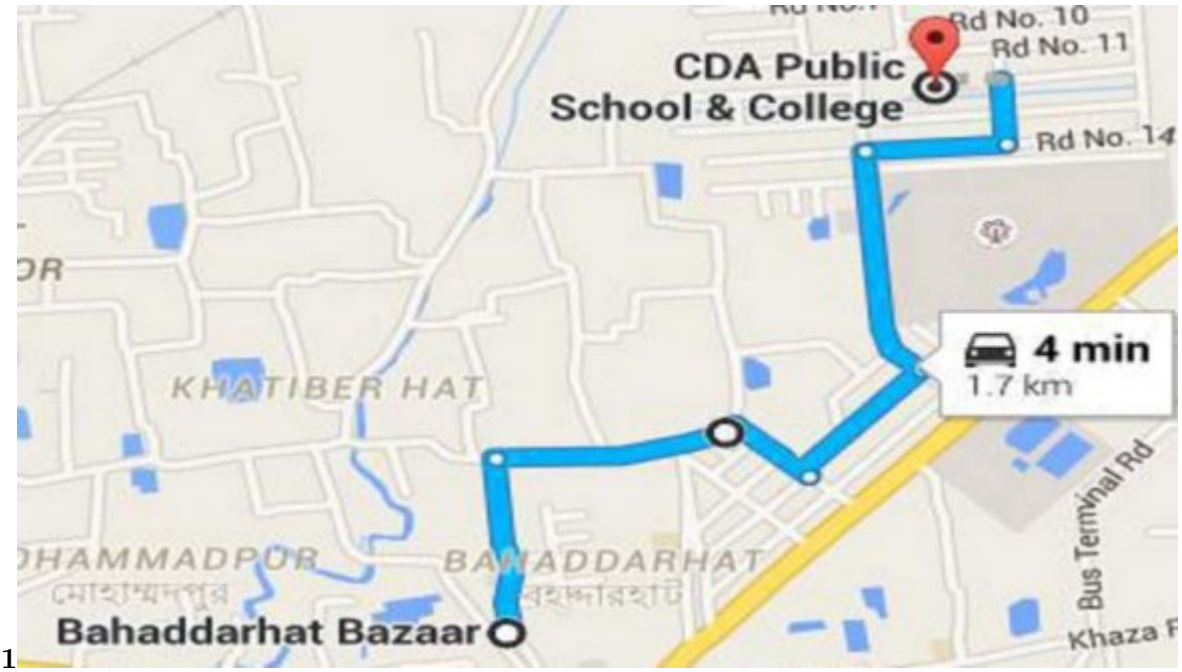
31 

Figure 6: Figure 3 . 1 :

1 

Figure 7: i. Location 1 (

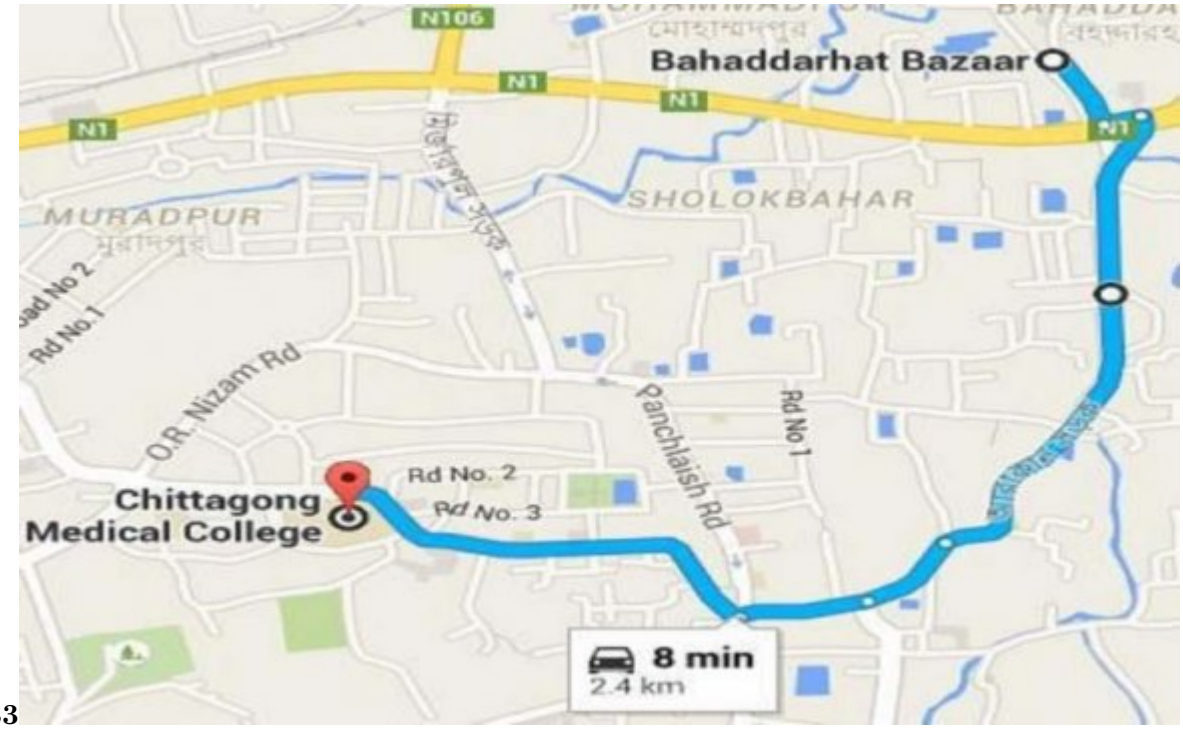


Figure 8: Figure 3 . 2 :Figure 3 . 3 :

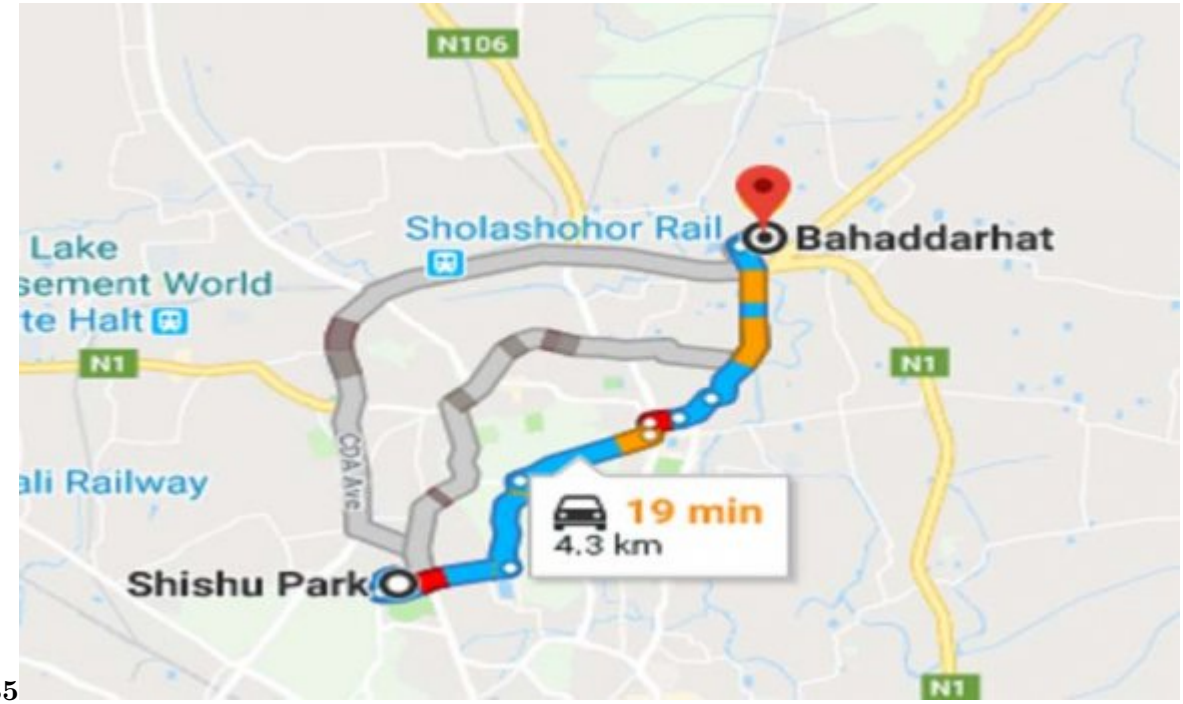


Figure 9: Figure 3 . 4 :Figure 3 . 5 :

Figure 10: Figure 3 . 6 :

Figure 11: Figure 3 . 7 :Figure 3 . 8 :

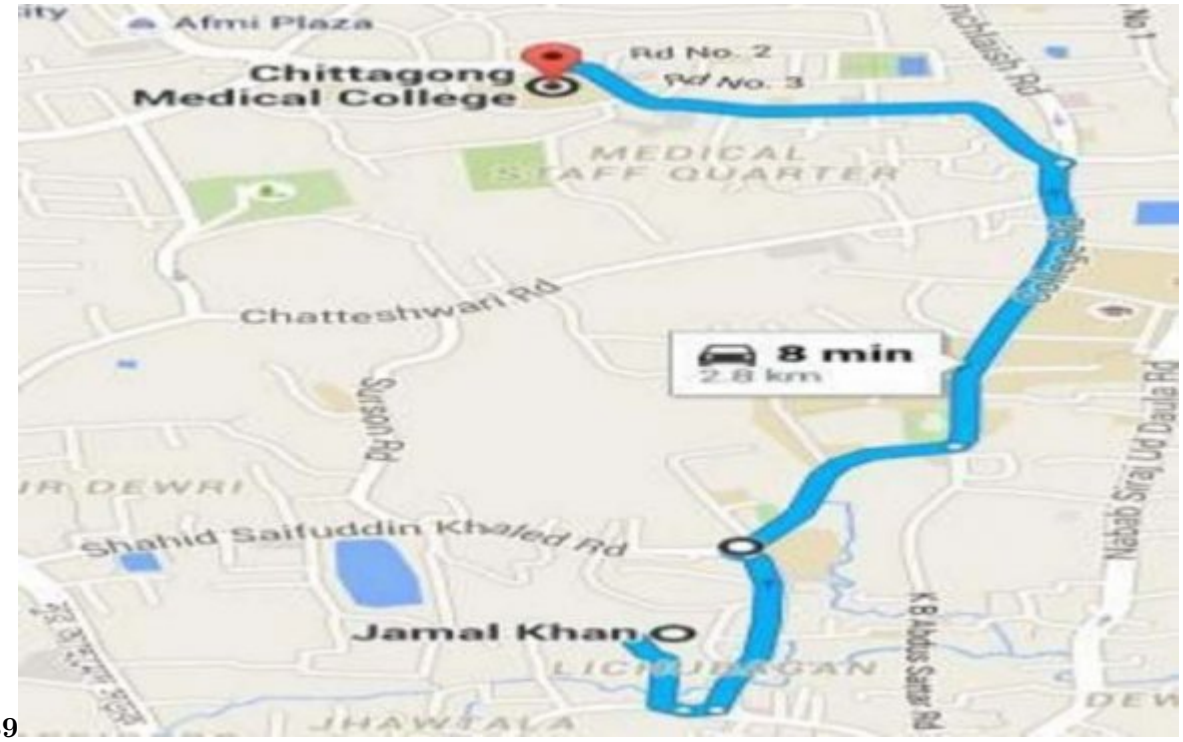


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Figure 12: Figure 3 . 9 :

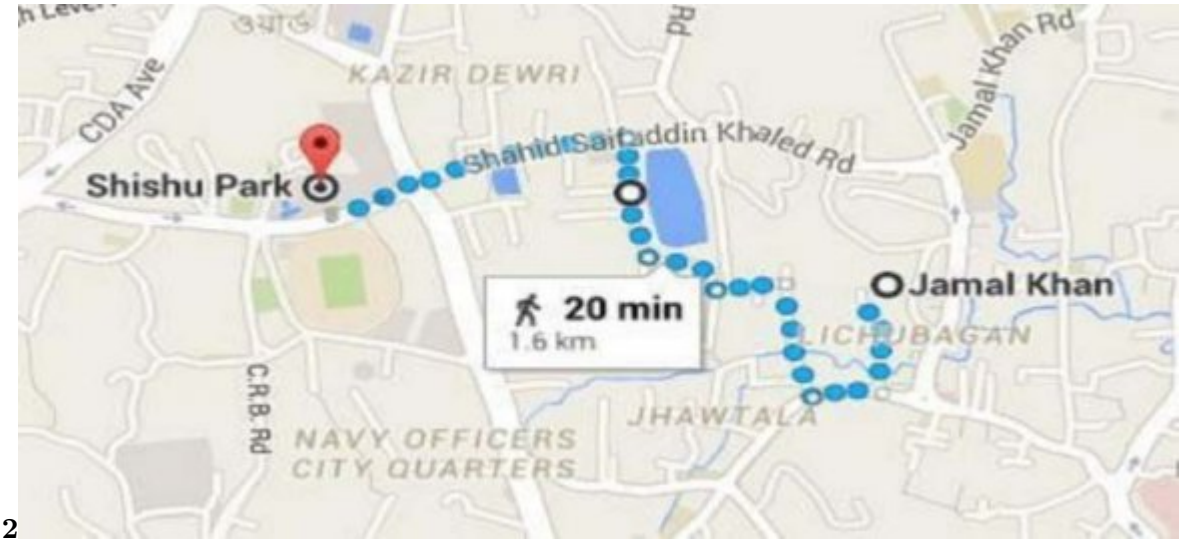

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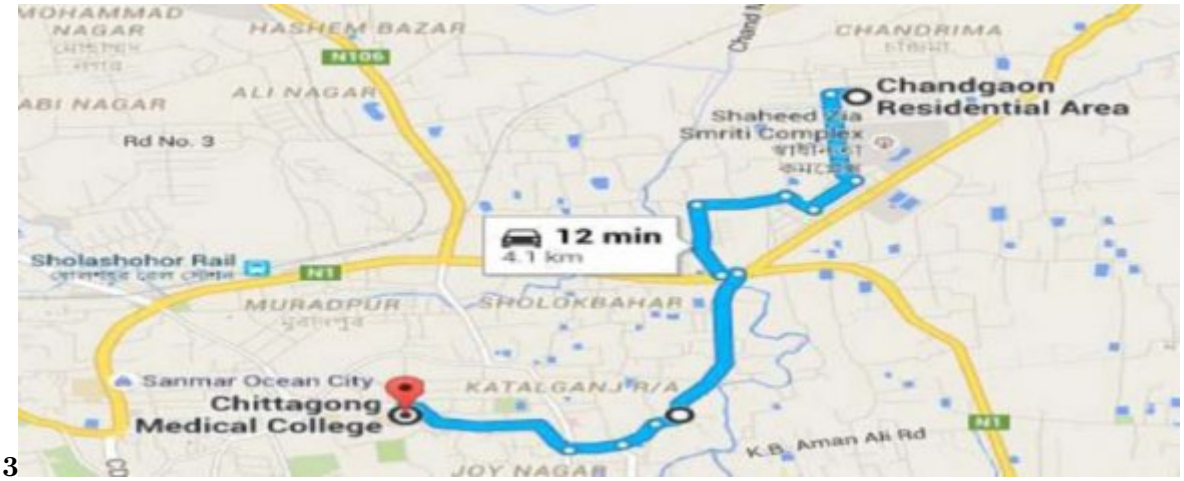
Figure 13: Figure 3 . 10 :Figure 3 . 12 :

313

Figure 14: Figure 3 . 13 :

314

Figure 15: Figure 3 . 14 :



3

Figure 16: Figure 3 .

3

Figure 17: Figure 3 .

3

Figure 18: Figure 3 .

21

Intensity of importance	
0	Less importance
0.1	Equal importance
0.2	Equal to moderately importance
0.3	Moderate importance
0.4	Moderate to strong importance
0.5	Strong importance
0.6	Strong to very strong importance
0.7	Very strong importance
0.8	Very to extremely strong importance
0.9	Extreme importance
1	Very extreme importance

Figure 19: Table 2 . 1 :

33

Location 1	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Bahaddar Hat Bazar	1700 m	250 m	2400 m	4300 m

Figure 20: Table 3 . 3 :

34

Location 2	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Jamal Khan	2400 m	1400 m	2800 m	1600 m

Figure 21: Table 3 . 4 :

35

Location 3	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Chandgoan R/A	150 m	1900 m	4100 m	6000 m

Figure 22: Table 3 . 5 :

36

Location 3	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Muradpur Cir	550 m	900 m	1200 m	3900 m

Figure 23: Table 3 . 6 :

37

Location	Criteria 1 (College)	Criteria 2 (Market)	Criteria 3 (Hospital)	Criteria 4 (Park)
Bahaddar Hat Bazar	1700 m	250 m	2400 m	4300 m
Jamal Khan	2400 m	1400 m	2800 m	1600 m
Chandgoan R/A	150 m	1900 m	4100 m	6000 m
Muradpur Cir	550 m	900 m	1200 m	3900 m

Figure 24: Table 3 . 7 :

38

Location Name	Criteria 1 (College) Standardization Score	Criteria 2 (Market) Standardization Score	Criteria 3 (Hospital) Standardization Score	Criteria 4 (Park) Standardization Score
Bahaddar Hat Bazar	150/1700=0.08	1 (Min)	1200/2400=0.5	1600/4300= 0.37
Jamal Khan	0 (Max)	250/1400=0.17	1200/2800=0.42	1 (Min)
Chandgoan R/A	1 (Min)	0 (Max)	0 (Max)	0 (Max)
Muradpur Cir	150/550=0.27	250/900=0.27	1 (Min)	1600/3900=0.41

Figure 25: Table 3 . 8 :

39

Location Name	Criteria 1 (College) Standardization Score and weight	Criteria 2 (Market) Standardization Score and weight	Criteria 3 (Hospital) Standardization Score and weight	Criteria 4 (Park) Standardization Score and weight
Bahaddar Hat Bazar	0.08*0.5	1*0.8	0.5*0.6	0.37*0.1
Jamal Khan	0 *0.5	0.17*0.8	0.42*0.6	1*0.1
Chandgoan R/A	1 *0.5	0*0.8	0 *0.6	0 *0.1
Muradpur Cir	0.27*0.5	0.27*0.8	1*0.6	0.41*0.1

Figure 26: Table 3 . 9 :

3

	A Model for Accommodation Selection using GIS and Multi-Criteria System		
Year 2018	Location Name Bahaddar Hat Bazar Jamal Khan Chandgoan R/A Muradpur Cir	Criteria 1 (College) Standardization Score and weight 0.04 0 0.5 0.135	Criteria 2 (Market) Standardization Score and weight 0.8 0.136 0 0.216
50 Volume XVIII Issue III Version I (B) Global Journal of Human Social Science -	Finally, add the all criteria score value. Which location totals are maximum this location is suita accommodation selection process. Using this equation is showing: Totals=Criteria 1+Criteria 2-		

Figure 27: Table 3 .

311

Location Name	Criteria1 (College)	Criteria 2 (Market)	Criteria3 (Hospital)	Criteria 4 (Park)	Total
Bahaddar Hat Bazar	0.04	0.8	0.3	0.037	1.117
Jamal Khan	0	0.136	0.252	0.1	0.712
Chandgoan R/A	0.5	0	0	0	0.5
Muradpur Cir	0.135	0.216	0.6	0.041	0.992

Figure 28: Table 3 . 11 :

Figure 29:

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