

## INTEGRATING THE RECREATIONAL SPACES OF RANGPUR CITY CORPORATION, BANGLADESH:

A perspective from space syntax

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### Abstract

*Rangpur, one of the most recent City Corporations of Bangladesh, is blessed with natural resources like open places, parks and water bodies at the centre of its city heart. This area has high potentiality to be developed as the central "Recreational Hub" of this newly announced City Corporation. Open spaces work as the lungs of a city or a town. But often it is observed that these gathering spaces are not used to its full potential due to the location and insufficient accessibility to these areas from rest of the city. This paper aims to study the integration and accessibility of the selected public recreational open spaces of Rangpur City Corporation with "Space syntax" methodology by using different Urban Intervention Strategies for increasing the integration of the specific area. Through comparison and analysis, this paper thrives to find out some strategic guidelines to be implemented for the utmost use of the selected public open areas and to increase the intelligibility of these recreational spaces within the upcoming Master Plan of Rangpur City Corporation.*

**Keywords:** Open space, Rangpur City, Space Syntax, Accessibility, Integration

**Theme:** Urban Space and Social, Economic and Cultural Phenomena

## **1. PROLOGUE : PLANNING AND DESIGN OF PUBLIC OPEN SPACES WITH EVIDENCE-BASED APPROACH**

The city as a collective project exists because its public spaces exist as well (Rubén, 2012). These public spaces have an important role regarding the environmental, economic and social context in the city as well as sources or providers of life, quality and sustainability (Chiesura, 2004). Basically, the public spaces are spaces of socialization where the interpersonal relationships are generated and these relationships and different kinds of them or their intensity may vary regarding place characteristics, time of use and frequency of social interactions (Gehl, 1956). Among these public spaces, a large number are open spaces. These open spaces include all private and public lands that are open in character and used as a place for open air recreation that may include from a small play lot to vast hunting grounds. Urban open spaces are considered as important elements of a city which need to be integrated to achieve a quality environment. According to Roger, "A clear articulation of public space connects neighbourhoods to connect to each other and link people within localities to their social institutions". Rogers (1999) In fact, open spaces which are accessible to general public, provide an integral and necessary part of urban living and an indispensable element within urban region. With a better urban design and environmental quality, the streets may be enhanced as "great streets" (Jacobs, 1996), facilitating the urban legibility and their own identity (Lynch, 1960) and so, improving an attractive image of the city. In this way, streets as connectors among public spaces (parks, gardens, etc) should be considered, analyzed, treated and designed as public spaces (Rubén, 2012). In this sense, the accessibility is related to pedestrian and this research considers this issue. The pedestrian movement is the mobility model that has the capacity of maintaining the most direct relationship and interaction with the city, e.g. through the senses, in the interaction with other pedestrians, in the possibility of participating in the trading activity and cultural one along the streets (Venturi, 1998) and enjoying the natural, architectonic environment (Jacobs, 1996). Regarding that, mobility plans appear much later than urban plans instead of drawing integration with joint strategies in future urban developments, where connected, integrated public open spaces is a priority as a revitalizing action in the city (Gehl, 1936).

The city of Rangpur, in Bangladesh, has been considered as an ideal area due to its urban history and the presence of a wide variety in the typology of streets and public spaces. The process of preparing Master Plan for Rangpur City Corporation of Rangpur, the newest divisional town of Bangladesh, has been undertaken to provide guidance for the development and development control of this area. It is found that a number of large and medium scale open spaces are scattered in Rangpur city which can set as the "Breathing Zone" of the city. In rapidly urbanizing countries, public open spaces are shrinking at an alarming rate. So it is high time to analyse how to create a well-connected city layout where all the public gathering spaces like open spaces, zoo, stadium, children's park etc will be connected ensuring pedestrian accessibility and should be highly integrated within the whole city grid so that people can have an easy access to these places which can create a strong social, cultural and environmental impact on the city-dwellers. Urban strategies should be taken to improve accessibility to the public open spaces to integrate these areas within the Master Plan. The extent to which an environment allows people a choice of access through it from place to place is a quality as termed as accessibility. Accessibility is an important tool of sustainability. It improves the economic, social and environmental condition of the area. With the increase of number of access routes, the choice increases and the environment becomes more responsive. Accessibility is important at two scales - at the city as a whole and to its immediate local. The relative ability of all the existing links to connect the site both to the city as a whole and to the immediate surroundings is considered to decide the relative importance of extending each link into and through the site, to achieve an appropriate balance between permeability at the city wide and local scales. Within the limited scope of a paper this research only deals with the

location and physical access to the open spaces.

This paper deals with the potential recreational hub of Rangpur City Corporation which is identified as large scale public open spaces and the analysis of physical location and accessibility of these spaces will be carried out by using 'Space Syntax'. In order to analyze all these questions about spatial characteristics; integration and visibility of the study area in Rangpur is going to be assessed. This paper intends to identify the public gathering spaces at the central area of Rangpur City Corporation and to analyze these open spaces in terms of accessibility as many of these are not potentially used because of inadequate accessibility (Rangpur Structure Plan, 1986). In order to assess how these areas are connected within the city, this paper will consider the followings:

- To identify the Integration Core of the Rangpur Sadar.
- To identify the areas of public open spaces, parks, play grounds and other recreational uses like green belts, retention pond, water bodies, natural reservoirs etc.
- To analyze the integration of some selected public open spaces and to assess the accessibility of these spaces using "Space Syntax".
- To suggest an Urban Intervention strategy to increase the potential use of these gathering spaces.

The present study only focuses on the large scale open spaces of Rangpur City Corporation within its limited scope. A sample of six recreational open spaces has been selected to analyze with "Space Syntax".

## 2. SPACE SYNTAX: METHODOLOGY

Space Syntax is a method for describing and analyzing the relationships between social structure and spatial structure. The analysis of the urban grids is based on the axial map. Integration is a static global measure. It describes the average depth of a space to all other spaces in the system. The spaces of a system can be ranked from the most integrated to the most segregated. Integration has now been found empirically to correlate well with observed patterns of space occupancy, use and movement in towns and cities in different parts of the world. Global Integration provides a global index of relative integration and segregation for that line relative to all others. Axial lines with warmer colours indicate high global or local integration value. In general, local integration relate to the spatial properties of space up to three steps ( $R=3$ ) away from the root. Intelligibility, is the correlation between connectivity and integration; and it describes how far the depth of a space from the layout as a whole can be inferred from the number of its direct connections, i. e. what can be understood of the global relation of a space from what can be observed within that space. The pedestrian accessibility to public spaces is usually analyzed in terms of time or distance of trips along the pedestrian network. This network and its configuration is a key factor to collect the pedestrian flows at different scales in the city; neighbourhood, quarter, district or city. Therefore, a planning process that analyzes these structural implications on the city could plan public spaces with better criteria (Rubén, 2012). This paper is developed on two key ideas: accessibility and spatial configuration. In application of these ideas or its measures it is going to link other concept, integration. Accessibility refers to the ease to arrive to facilities, activities or goals, which could be appointed in general as opportunities. In addition accessibility could be defined as "the intensity of the possibility of interaction" (Hansen, 1959) and interchange (Engwicht, 1993). The spatial configuration plays a primitive or principal role for the pedestrian mobility (Hillier et al, 1993).

Under the theory of Space Syntax the proposed integration measures the degree in which a node is integrated or segregated with respect to a part of total (local integration) or the whole (global integration). This paper is based on the pedestrian network and the public space of the Rangpur City. To undertake spatial configuration analysis based on street network, different measures of axial map have been used here as provided by the spatial configuration software DepthMap, developed by Alasdair Turner. Local-global integration and intelligibility are some of the most interesting measures that could be used to analyze spatial configuration in the Rangpur city. These measures of spatial configuration in the axial map are put in together with the diversity of public space and their capacity to offer accessibility. Then analysis with Space Syntax has been done on two phases.

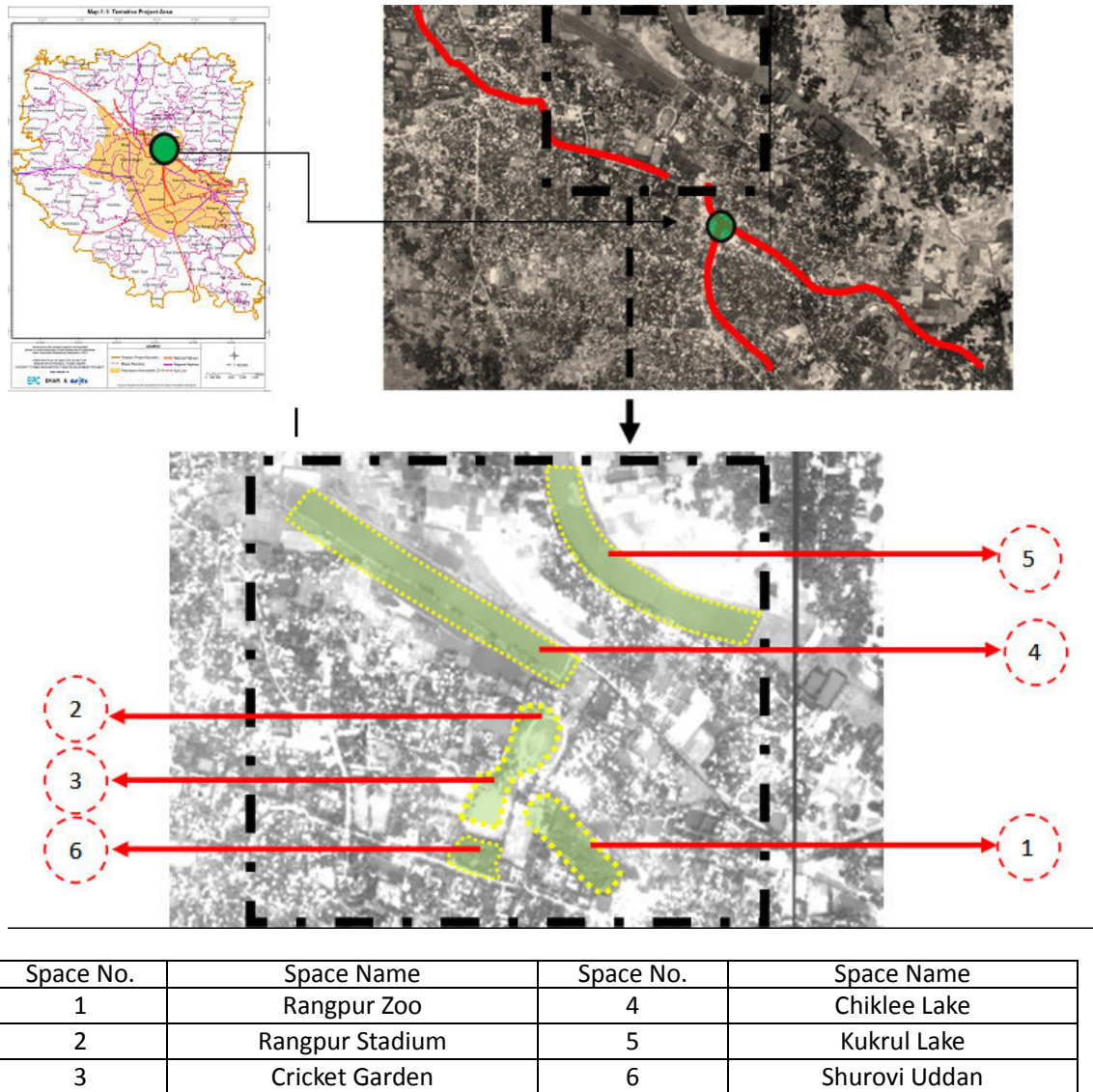
**Phase 01:** The configurational properties of the Rangpur Sadar Upazilla have been analyzed by "Space Syntax". Then six large open spaces have been selected as recreational open spaces based on Field Survey. The location and accessibility of these open spaces have been analyzed.

**Phase 02:** By creating different options of Urban Interventions, results have been analysed. Then the findings of the syntactic analysis are triangulated with some observations which led to some Design Guidelines to increase the integration and accessibility of the selected area.

### 3. CASE OF STUDY: RANGPUR CITY

This research work is developed on the pedestrian network of Rangpur city and its public spaces. The definition of public spaces collects a diversity of spaces as squares, gardens, parks, or playgrounds. Rangpur city is located in the northern region of Bangladesh. Geographically it is located between 15003' and 26000' North latitudes and between 88o57' and 89o32' east longitudes. Rangpur is situated on the bank of the river Ghagat- a tributary of the river Teesta.

The Master Plan of Rangpur city corporation is going on for an area of approximately 200 sq. Km. According to the Population Census 2001, total population of Rangpur paurashava was 465,768. Compared to other urban centers of the region, urban growth is quite high in Rangpur. It is the seventh largest town of the country. The importance of Rangpur town enhanced with the declaration of Rangpur division in January 2010. The Rangpur Municipality had been upgraded into City Corporation in 2011. Rangpur division has a bright prospect to become one of country's strong economic bases if its potential for agricultural production could be harnessed properly. The region is endowed with various natural resources. If proper attention is given in exploitation of these resources, it is likely to become a prosperous economic zone of the country (Rangpur Inception Report, 2012). The region will demand high level services in education, healthcare, job security and other opportunities commensurate with a regional centre. Simultaneously the need of recreational zone as well as interactive spaces will become one of most the important priorities of the city. Therefore, it is important to prepare itself with a proper Master Plan for physical growth of the city in such a way that it can meet the recreational need with provisions of utility services of modern living. It was mentioned in Rangpur Structure Plan, 1986 that recreational facilities in Rangpur are conspicuous by their absence. Most games and athletics are practices and held in Collectorate Ground. The stadium is in a bad shape, while the newly constructed gymnasium has been commissioned by the District Sports Association. The need for parks, playgrounds and recreational facilities are real and pressing. The Paurashava has undertaken a scheme of developing the Chikli Lake into a lake park but inadequate accesses, funds, insensitivity to the natural features and isolation from the urban fabric render the park unattractive. Both Chikli and Kukrul lakes are excellent natural resources for recreation. They have higher potentials than is being realised. There is no reason why these cannot be developed and integrated into the urban system

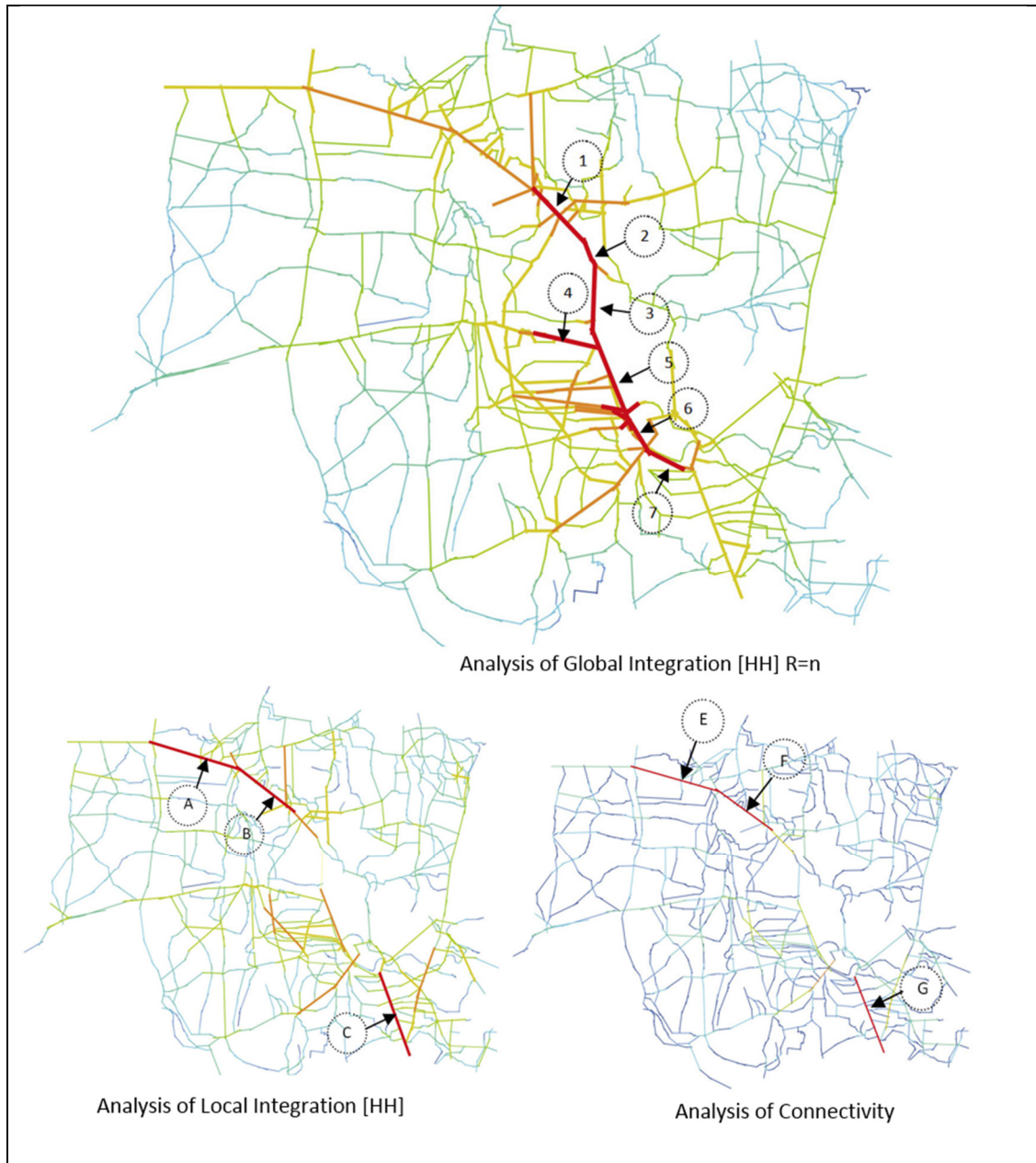


**Figure 1** Selection of Sample Area in Rangpur City Corporation

So, if proper actions are taken there is a high chance to improve the existing recreational condition of Rangpur as it is blessed with many natural features like public open spaces at the centre which is identified as a highly potential “Recreational Hub” performing as successful public gathering spaces. This recreational hub consists of several gathering spaces as listed below: Rangpur Zoo and Botanical Garden, Football Stadium, Cricket Garben, Shuruvi Uddan, Rangpur Shishu Park, Chiklee Bill, Kukrul Bill, Shamshundoru Canal, Eidgah, Long Tennis Complex, Table Tennis Complex, Rangpur Zilla School Field, Rangpur Govt. College Field etc. Six major Public Open Spaces have been identified as the sample area to analyze the integration and accessibility of these spaces with the whole city. (Figure:1)

## 4. SPATIAL ANALYSIS OF RANGPUR CITY: AN ASSESSMENT OF RECREATIONAL OPEN SPACES

### 4.1 General Spatial Character of Rangpur Sadar



1,2,3,4,5,6,7	Most Integrated Road, R=n
A,B,C	Most Integrated Road, R=3
E,F,G	Roads with maximum Connectivity

**Figure 2** Spatial Analysis of Rangpur Sadar Upazila

As the map of Rangpur City Corporation is in process, the map of Rangpur Sadar Upazila (prepared by “GIS UNIT” of Local Government Engineering Department, compiled from LGED Upazila Base Maps 1994-95, Landsat TM 1998, GPS Survey 1999 and Field Checking in 2010), which creates the larger part of the city corporation, has been used as the Base Map for the Syntactic

Analysis of this area. The Axial Map of Rangpur Sadar Upazila has been analyzed by Depthmap and Global Integration(R=n), Local Integration (R=3) and Connectivity measures are considered.

The high value lines (marked with red by Space Syntax) of Global Integration, Local Integration and Connectivity are identified and compared with corresponding 10% Core. It is found that all the red marked lines in Global context (Road No.1-7), in Local context (Road No A,B,C) and for Connectivity (Road E,F,G ) are within the 10 % Core of corresponding measure of Rangpur Sadar Upazila.

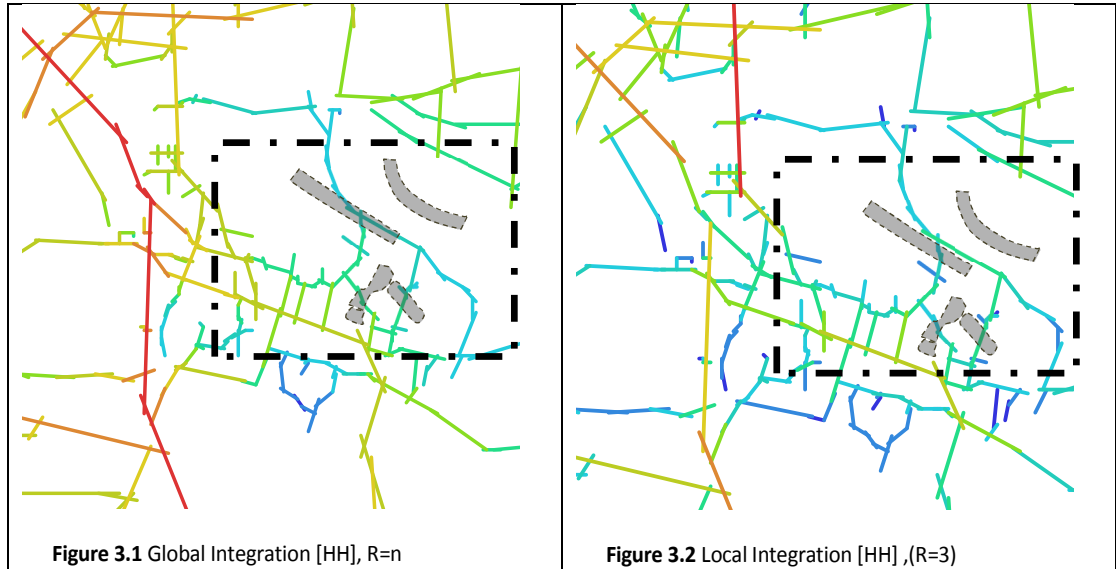
**Table 1 Global Integration Values, Local Integration Values and Connectivity**

Road No Ref: Fig:02	Global Integration Value, HH	Local Integration Values[HH]	Connectivity
1	0.78370184		
2	0.77553898		
3	0.79272395		
4	0.76135504		
5	0.81299067		
6	0.80449224		
7	0.76928514		
A		2.84504	
B		3.03122	
C		2.85137	
E			12
F			13
G			13
Max	0.81299067	3.0312238	13
Min	0.65717131	1.9310595	4
Mean	0.533366	1.24766	2.82905

#### 4.2 Spatial evaluation of the selected open spaces

To have more detailed information about the selected sample area of recreational open spaces, the existing map is updated with scientific information and this base map has been used to analysis the accessibility into the selected recreational area. With the aim of observing the spatial configuration in a more detailed way, some public spaces have been selected in this paper. The sample area of six recreational open spaces is identified on the Axial Map and analysed by Space syntax to identify their positions within Global and Local Integration of Rangpur Sadar Upazilla.





**Figure 3** Analysis of six recreational open spaces

By Space Syntax, the Global, Local Integration and Connectivity of Rangpur City Corporation have been analyzed. Then only the sample area is observed thoroughly to understand consequently the Global and Local Integration around the selected Public Open spaces. (Figure 3)

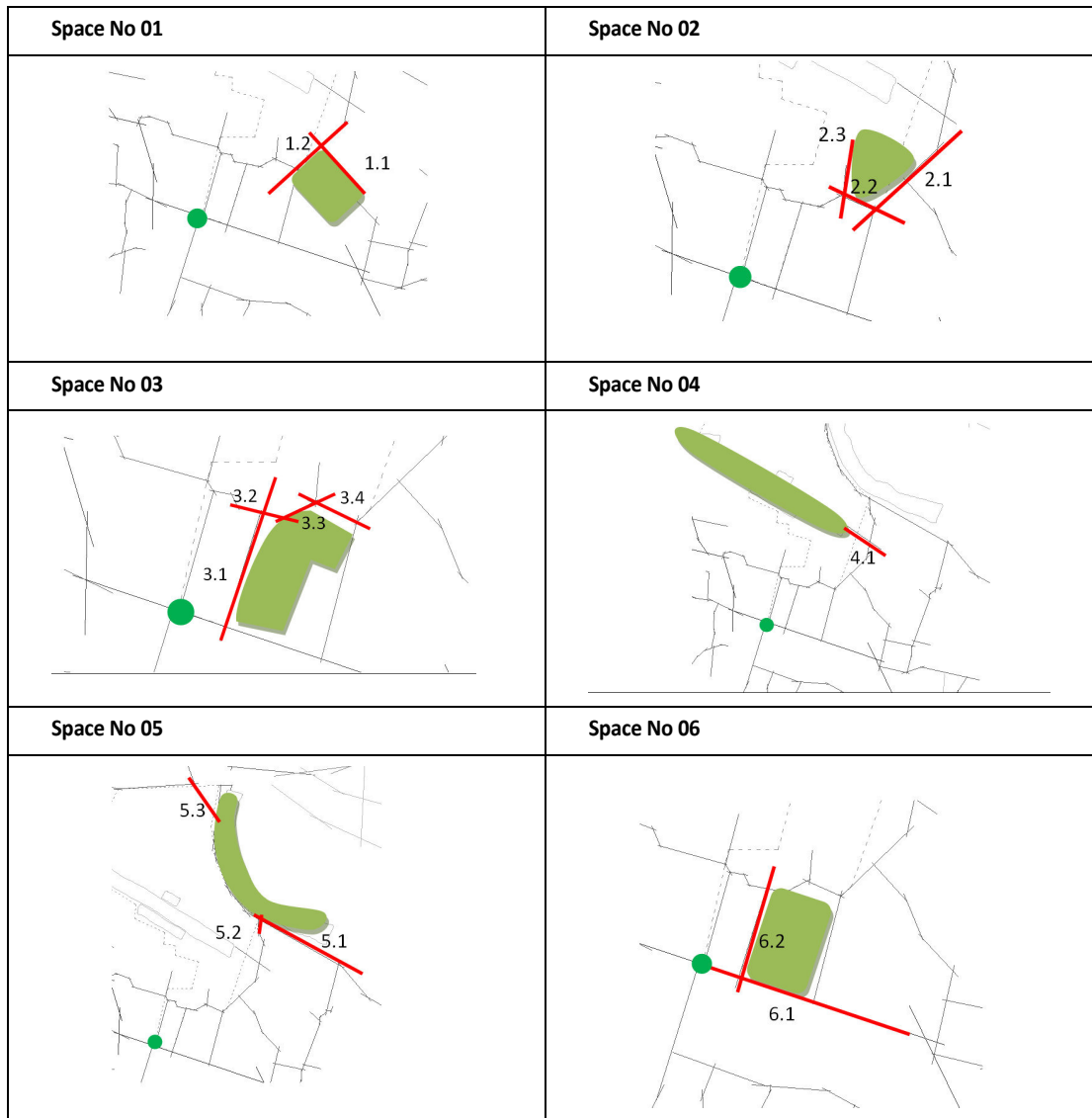
#### 4.3 Identifying Access Road to Sample Area

**Table 2** Public Open Spaces with their Connectivity and Integration Value

No.	Open Space	Access Road	Connectivity	integration HH R=n	integration HH R=3
1	Rangpur Zoo	1.1	2	0.5215676	1.1365665
		1.2	4	0.55811375	1.6037242
2	Rangpur Stadium	2.1	4	0.55811375	1.6037242
		2.2	4	0.55670172	1.4724894
		2.3	2	0.51987326	1.0207884
3	Cricket Graden	3.1	2	0.59516197	1.5226898
		3.2	3	0.55453873	1.31797
		3.3	3	0.52010363	1.3057258
		3.4	4	0.55670172	1.4724894
4	Chiklee Lake	4.1	1	0.49220547	0.68957245
5	Kukrul Lake	5.1	4	0.4588870	1.569167
		5.2	2	0.47528327	1.1365665
		5.3	2	0.4438267	1.1
6	Shurovi Uddan	6.1	7	0.64385182	2.2132308
		6.2	2	0.5951619	1.5226898
Max			7	0.64385182	2.2132308
Min			1	0.44382674	0.68957245
Mean			4	0.54383928	1.451401625

The integration of the access roads of the six selected open spaces are analyzed to understand how this sample area is integrated with the whole city at present. (Figure 4)





**Figure 4** Access road Identification

#### 4.4 Analysis of Access Road to Sample Area:

To develop a better urban planning with regard to public spaces and pedestrian accessibility, spatial configuration need to be analyzed during the processes of spatial planning. At the same time, issue of urban planning dealing with public spaces and that of mobility planning dealing with accessibility should be managed in an integrated way. Now, the Global and Local Integration, and Connectivity of these access roads are analyzed to evaluate the existing condition of Intelligibility of the recreational spaces. (Table: 2)

##### 4.4.1 Global Integration of Access Roads:

The mean Global Integration of the city is 0.541969. Now the Global Integrations of the access roads to the recreational spaces are compared below.

**Rangpur Zoo** (Space No.1: Rd 1.1,1.2) : The Average integration value (0.539841) of the access roads of Rangpur Zoo is lower than the Mean Global Integration value of the city (0.54383928). So this Zoo should be rather integrated with the city to attract people. This zoo contains a Botanical Garden and Shushu park within its premise. So it has a high potential to be one of the most successful Public Spaces of this City Corporation.

**Rangpur Stadium** (Space No. 2, Rd 2.1, 2.2, 2.3): It does not hold a high integration value. As Rangpur City Corporation has been already announced, there is a good chance to convert this existing stadium as an international Stadium in near future. So to invite thousands of people, for an international match, it should be more integrated within the city.

**Cricket Garden** (Space No. 3, Rd3.1, 3.2, 3.3, and 3.4): This is moderately connected with the city (higher than Mean Global Integration 0.54383928). But the Stadium has not been built in this area. But it is functioning as a public open space as various tournaments take place and people gather from various areas to enjoy the matches.

**Chiklee Lake** (Space No.4, Rd 4.1) and **Kukrul Lake** (Space No.5, Rd 5.1, 5.2): These lakes have a very low Global Integration value which is less than 0.5 (Mean Global Integration 0.54383928). So these spaces with high potentiality are not working as successful public open space because of the lack of proper integration with the city. So the issue identified by Rangpur Structure Plan (1986) about lack of accessibility is attested for this area.

**Shurovi Uddyan** (Space No.6: Rd 6.1, 6.2): Shurovi Uddyan has the highest Global Integration value among the six public open spaces which indicates this space is strongly integrated with the City.

**4.4.2 Local Integration of Access Roads:** The mean Local Integration of the city is 1.32681. Below, the Local Integration of the access roads to the recreational spaces is compared.

**Rangpur Stadium** (Space No.2, Rd 2.1, 2.2, 2.3) has a moderately good Local Integration value which is higher than Mean Local Integration (1.32681). Rangpur stands at a High-risk Earthquake prone area. So, this stadium should have the scope of being used as an Earthquake Shelter. As higher Local Integration value is an indicator of a successful Earthquake Shelter, the values indicate that it will work successfully during the disaster period.

The most interesting observation from the analysis is, one of the access road of **Kukrul Lake** (Space No.5, Rd 5.1) has the third highest Local Integration value (1.560167) but it is not functioning as a successful open space. So only the high Local Integration Value cannot be the indicator of a successful public open space. So, to create a successful public open space the Global integration values of the places need to be increased, instead the Local Integration.

#### 4.4.3 Connectivity of Access Roads

One of the access roads of Cricket Garden (Space No 3), Road 3.1 has a very low connectivity (2), but the Global Integration value is 0.59516197, which is higher than the Mean Global Integration (0.541969) of Rangpur City. One of the access roads of Kukrul Lake (road 5.1) has a good connectivity (4) but Global Integration is very low (0.4588707) and it is weakly integrated with the city. Here, Connectivity shows a strong relationship with Local Integration but not with the Global Integration. Therefore, here Connectivity cannot be considered as an indicator of a good public space as its relationship with Global Integration, an indicator of the public gathering space, is not so significant.

## 5. PROPOSED SPATIAL INTERVENTIONS AND THEIR EFFECTS

Rangpur City has grown for years in an unplanned manner. Now as Rangpur has been declared as a Division and Rangpur City Corporation has also been announced, this area will now have a huge growth within a very short period. It is high time to have a rational and sensible planning for this area as it still has the potential to be a well integrated and sustainable City Corporation in future.



**Figure 5** Alternative Spatial Intervention Strategies

In addition, the design solutions must be sustainable in socially and economically. Therefore, these places need to be pedestrian based and walkable. People will use the place only if these places are strongly integrated. It will reduce fuel and energy consumption and also strengthen the social bond. The Spatial Intervention Strategy suggests integrating the Recreational Hub within the city. Now various alternations of intervention strategies are proposed to increase the accessibility to this hub. Then these proposals are analyzed by Space Syntax to observe the effects of various solutions. Finally, a design guideline is proposed by incorporating all the positive attributes of the alternative proposals.

**Proposal 01:** This proposes to connect the Chiklee Lake (Space No. 4) and Kukrul Lake (Space No. 5) with the Highway (H) by "Road A". These two lakes are connected with the Main road (M) by "Road B". Then these roads, A and B, are connected by "Road C" along the Chiklee Lake. Also, the Football Stadium (Space No. 2), Cricket Garden (Space No. 3) and Zoo (Space No. 1) are connected by an inner road "Road D".

**Proposal 02:** This proposes to connect the Kukrul Lake (Space No.5) with the Highway (H) by "Road E"; and to connect the Highway (H) and Main Road (M) by "Road F" as the existing one is not bold. As the eastern part has not yet developed, a new "Road G" is proposed towards the eastern part to increase the integration of the recreational areas.

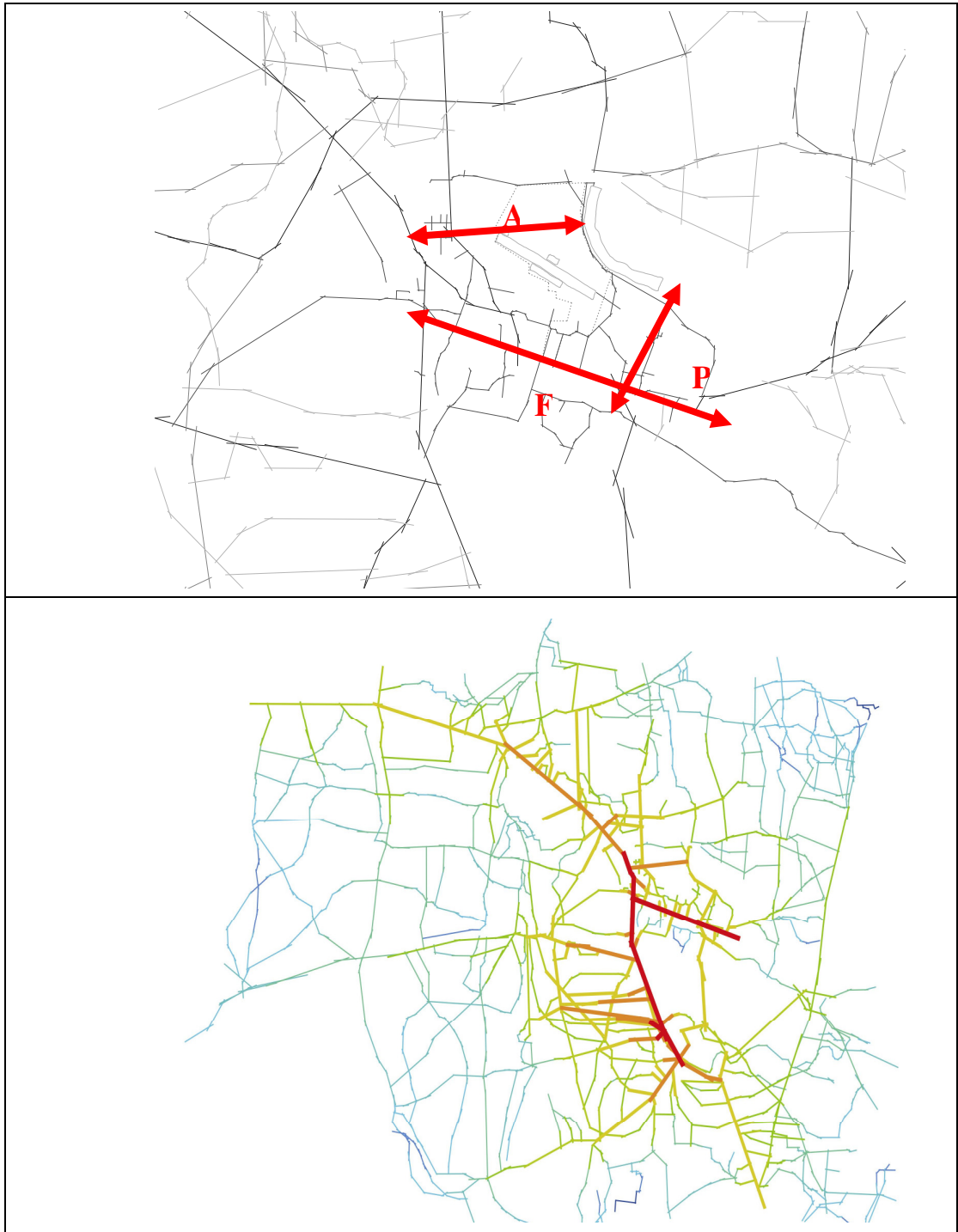
**Proposal 03:** This proposes to connect the Chiklee Lake (Space No. 4) and Kukrul Lake (Space No. 5) with the main road (M). A new "Road P" is proposed here, which will also be connected with the eastern city by Road Q. The Kukrul Lake can also be connected to an existing road (northern part) by "Road R".

Now by observing the impact of these three intervention strategies, this paper proposes design guideline to increase integration of these selected public open spaces of Rangpur City Corporation. From Proposal 01, it is observed that "Road A" can increase the Global Integration of the recreational Hub as it connects both the lakes (Space No.4 and 5) with the most integrated road. From Proposal 02, the "Road F" increases the Global Integration of the main road as it connects the Shurovi Uddan (Space No.6), Rangpur zoo (Space No. 1) with the most integrated road. From Proposal 03, it is observed that "Road P" increases the integration of the eastern part with the city and improves the connection with the recreational Hub. So these three interventions are implemented into this area and the impact is observed by Space Syntax.

This intervention has created two new access roads to Chiklee Lake (Road 4.2) and Kukrul Lake (Road 5.4). Now the effects of this intervention are analyzed below.

**Table 5** Existing and Proposed Access roads to the selected open Spaces

	Existing		Proposed	
	Global Integration	Connectivity	Global Integration	Connectivity
Rd-1.1	0.52156764	2	0.64182335	2
Rd-1.2	0.55811375	4	0.69776517	4
Rd-2.1	0.55811375	4	0.69776517	4
Rd-2.2	0.55670172	4	0.69762665	4
Rd-2.3	0.51987326	2	0.64073122	2
Rd-3.1	0.59516197	2	0.76450092	2
Rd-3.2	0.55453873	3	0.69739592	3
Rd-3.3	0.52010363	3	0.64108181	3
Rd-3.4	0.55670172	4	0.69762665	4
Rd-4.1	0.49220547	1	0.59772277	1
Rd-4.2		0	0.79703897	8
Rd-5.1	0.45888707	4	0.74039549	5
Rd-5.2	0.47528327	2	0.67693305	2
Rd-5.3	0.44382674	2	0.6659444	2
Rd-5.4		0	0.79703897	8
Rd-6.1	0.64385182	7	0.84677792	19
Rd-6.2	0.59516197	2	0.76450092	2



**Figure 6** Proposed Intervention Strategy and their spatial impact

Figure 07 shows that the proposed Urban Intervention Strategy has significantly improved the Global Integration values (marked with Red) of the selected open spaces. The Master Plan of Rangpur City Corporation can adopt these guidelines to integrate the Central Recreational Hub within the whole City.

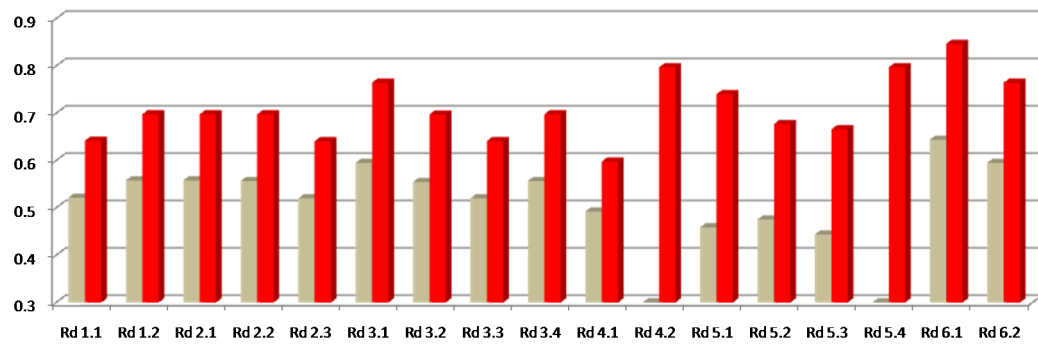


Figure 7 Comparative Analysis of Global Integration of Access Roads

The Intelligibly Graph shows that the value slope, correlation (R) has improved from 0.52155 to 0.74967. So this intervention converts the city into a much more legible and readable area which has relationship of becoming a successful Public Open Spaces.

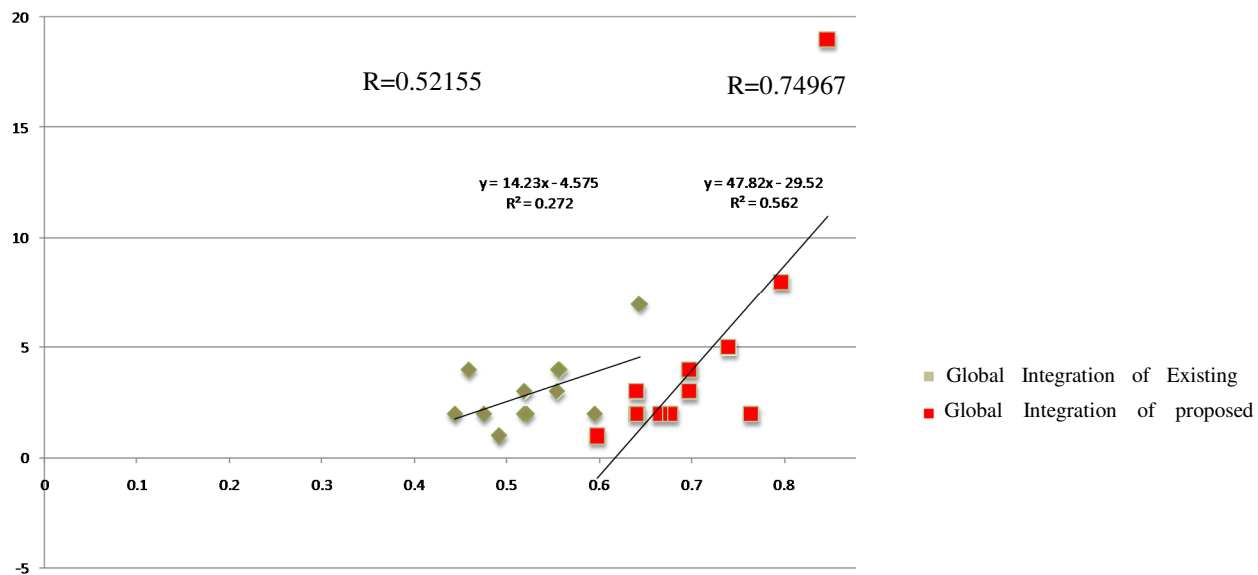


Figure 8 Comparative Analysis of Intelligibly of Access Roads

## 8. CONCLUDING REMARKS

The Master Plan of Rangpur City Corporation has full potentiality to develop as a well balanced area in future with both buildings and public spaces. This paper provides a base of an Intervention Strategy for the upcoming Master Plan of Rangpur City Corporation. If large scale open spaces locate at highly integrated area, these will be within people's daily movement network and used frequently. So, the use of the central Recreational Hub of Rangpur City Corporation should be improved by implementing intervention of this urban strategy to integrate the six large open spaces with the city grid. Space Syntax helps us to analyze the accessibility of these open spaces which in turn helps in such decision-making. This paper, thus, suggests an Urban Intervention Strategy based on Space Syntax to integrate the public open spaces with the city. Further studies and analysis have to be done to have a comprehensive planning proposal of Rangpur City Corporation.

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