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DESIGNING URBAN OPEN SPACES OF BARDDHAMAN TOWN, WEST BENGAL, INDIA

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Abstract. Located in 23^o14'N latitude and 87^o 51' E longitudes, Barddhaman, the Class I town (since 1961) is the head-quarter of the Barddhaman district, West Bengal, India. In term of size of population, the town ranked 13th in the state. Being site and situational advantages, this agriculturally prosperous town since its inception has been recognised as the seat of settled civilization. Urban open spaces are important component to sustainable living in urban areas as they provide environmental, social and economic benefits. Barddhaman town has 122 open space sites comprising an area of 193 ha (8.59%): some are used as playground and rest are vacant as non-used assets. The present work intends to build a framework for rational use of open spaces for the sustenance of the town. For the present study 20 of such open spaces have been selected and comparatively analysed on the basis of standard score of two variables: distance from CBD (1) and areal extent (2) to find out their economic and environmental significance. Finally, a proposal has made for the uses of open spaces to make the town sustainable.

Keywords: *Open space, town, CBD, standard score, environment, sustainable town*

I. INTRODUCTION

Urban open spaces are important part of the urban landscape with its specific function. It contributes to the quality of urban life in many ways (Burke and Evans, 1999). According to Thompson, (2002) “open spaces are places in the city where cultural diversity intermingled with natural processes and conserve memories”. Open spaces play a vital role in maintaining sustainable cities. Sustainable development in cities is defined as “development that meets the needs of the present without compromising the ability of the future generations to meet their own needs” (United Nations, 1987). Urban open spaces are providing benefits to the cities and their residents to advance to sustainability and improve the quality

of life (Kim and Wentz, 2010). Functions of open spaces can be point out as environmental and ecological function; social and societal function and structural and aesthetic function. Environmental and ecological function includes climatic amelioration, noise screening, influencing the hydrological cycle- storm water management and providing habitat for wild plants and animal. Social and societal functions include providing space and facilities for leisure and recreation, facilitating social contact and communication, access to and experience of nature and influencing human physical and psychological health and well-being. Structural and aesthetic functions include articulating, dividing and linking areas of the urban fabric, improving the legibility of the city, establishing a sense of place and acting as a carrier of identity, meaning and value (Francis, 1986).

Urban open spaces are open landscape in the urban area like playground, parks, green spaces and other unused areas which are important for sustainable living in 'urban enclave' as they provide social, economic and environmental benefits. Nowadays, the concept of open space is not limited to parks and playground and preserves in the 'complex matrix of urbanity' it includes non-park and non-natural areas also. The study of urban open space deals mainly with the surface utilisation. In general open spaces include streets, schoolyards and public squares (Hall, 1998). Land use patterns are usually dynamic in the city. Open spaces are maintained for recreational or ornamental purposes mainly (Mather, 1986).

The paper considers the hypothesis that greater the distance from the CBD, economic value of open space decreases whereas, environmental value increases. In Barddhaman town these areas are open to the society and proper designing can make them attractive too. The paper focuses on the characteristics of open spaces in Barddhaman town and builds design of open spaces of the town to guide local authority in long term planning process.

II. STUDY AREA

As per provisional census of India (2011), West Bengal is the 4th most populous state of India and consists of 19 districts. In terms of percent of urban population Barddhaman district ranked 4th (39.87%) in the state. The name 'Barddhaman' implies the increasing or prosperous growth centre. In the progress of *Aryanisation* from the upper Ganges valley, the frontier colony was called Barddhaman as a landmark of growth and prosperity (Paterson, 1910). Barddhaman or Burdwan town (23°14'N and 87°51'E) is the administrative head quarter of Burdwan district, West Bengal, India. Barddhaman is categorised as a Class I town (Census of India, 2001). The river Damodar constitutes the southern

boundary of the town. Being site and situational advantages, this prosperous town has been recognised as the seat of settled civilization since its inception. Distinct growth nuclei have evolved in different time periods. The town has come across long experiences from Muslim, Mughal, Barddhaman *rajās* and British rulers to Post Independence phase. Therefore, one could easily find the fabric of time in its structure. The town has flourished mainly as an administrative centre and as a centre of trade (Ghosh and Chakma, 2010). (Fig.1).

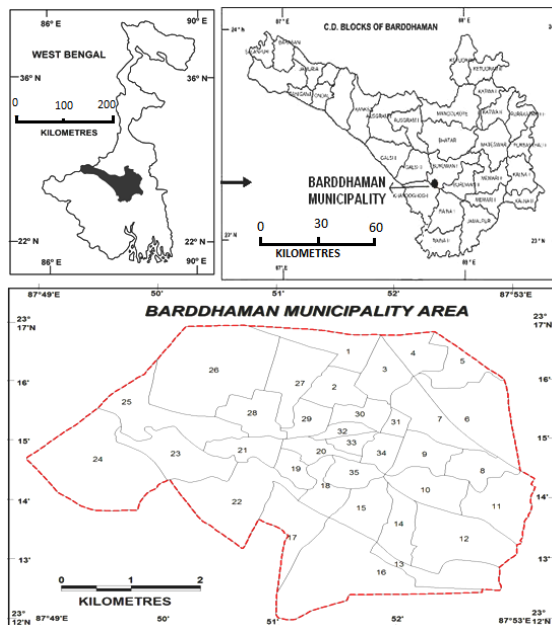


Fig. 1 Location of Barddhaman town/Municipality

III. MATERIALS AND METHODS

The paper is based on quantitative methods. Materials have been collected from secondary sources as well as field survey. Land use map of the town has been collected from Barddhaman municipality office. This map was fitted in MAP INFO professional software (version 7.0) by the process of georeferencing with respect to latitude and longitude of at least four points. Then all the open spaces were digitized one by one and clicking on the area of them got the area of individual open space in sq. mile which was converted into hectare. The town has 122 open space sites comprising an area of 193 ha (8.59%). For the present study 20 of such open space sites (areal extent: 1.89-18.13 ha) have been selected and comparatively

analysed on the basis of ‘Standard scores’ or ‘Z score’ (Burt and Barber, 1996). In statistics, a standard score indicates by how many standard deviations an observation is above or below the mean. The Standard score (z) of a raw score x is:

$$Z = \frac{x - \mu}{\sigma},$$

where, μ is the mean; σ is the standard deviation.

Finally, a proposal has made to design the existing open spaces of the town.

IV. RESULTS AND DISCUSSION

IV.1 Population characteristics

Population of the town has increased at an exponential rate. In 1901, population was 35022. In 1921, population was decreased to 34616. Afterwards population continued to increase as a result of natural growth and immigration from peripheral rural areas. In 1961, the town got the status of the Class I town having population of 1,07,881. In 1991, population figure reached 2,45,079. As per Census 2001, population became 2, 85,602 (**Fig. 2**). According to the ‘Literacy Survey Report, Barddhaman: 2008’, the population figure is 3,21,937. The projected population for the year 2025 is 4, 35, 000.

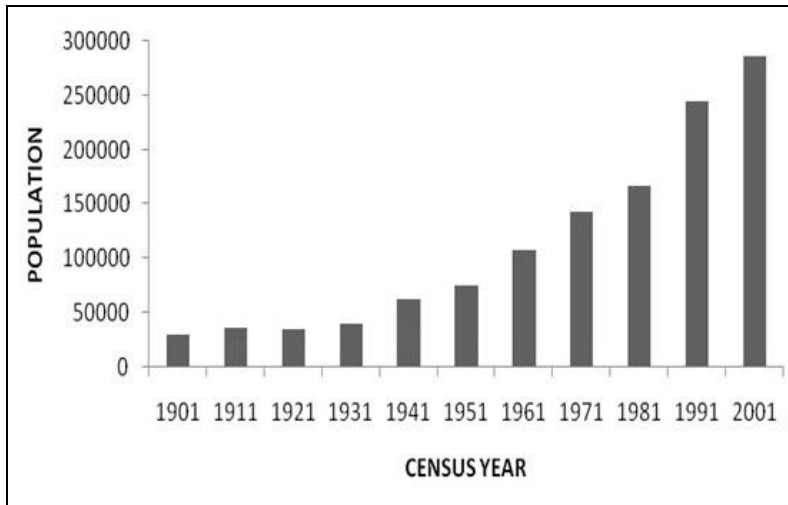


Fig.2. Population growth of Barddhaman town(1901-2001)

The internal structure of the town resembles similarity with any other old and unplanned towns of West Bengal. Population density is high (>20,000 persons /km²) in the central locations with high accessibility. The wards with peripheral locations have low population density (<10000 persons / km²). The average density of population of the town is 12,396 persons/ km². On an average there is a decrease of 5840 population density/km² with 1 km increase in distance from CBD. Distance decay effect is prominent in case of land rent/ land value distribution.

IV.2 Open space characteristics

Land use is the most dynamic and therefore the most important component in the analysis of the town. The dominant land use category is residential (1331.68 ha). The amount of open spaces is calculated as 193 ha (Table 1).

Table 1: Open spaces of Barddhaman town, 2011

Ward no.	Percent of Open Space	Area of Open Space (ha)	Ward no.	Percent of Open Space	Area of Open Space (ha)
1	4.7	3			
2	6.3	3	19	10.7	3
3	0	0	20	0	0
4	6.8	3	21	2.44	10
5	10	5	22	12.1	15
6	18	20	23	8.05	8
7	15.3	1	24	3.5	7
8	4.25	2	25	20.3	22
9	3.85	2	26	8.5	11
10	0	0	27	5.9	5
11	9.68	6	28	1.64	2
12	15.5	19	29	0	0
13	15	15	30	2.9	1
14	1.92	1	31	0	0
15	1.6	1	32	0	0
16	17.62	18	33	0	0
17	9.21	6	34	0	0
18	4.55	2	35	5.71	2

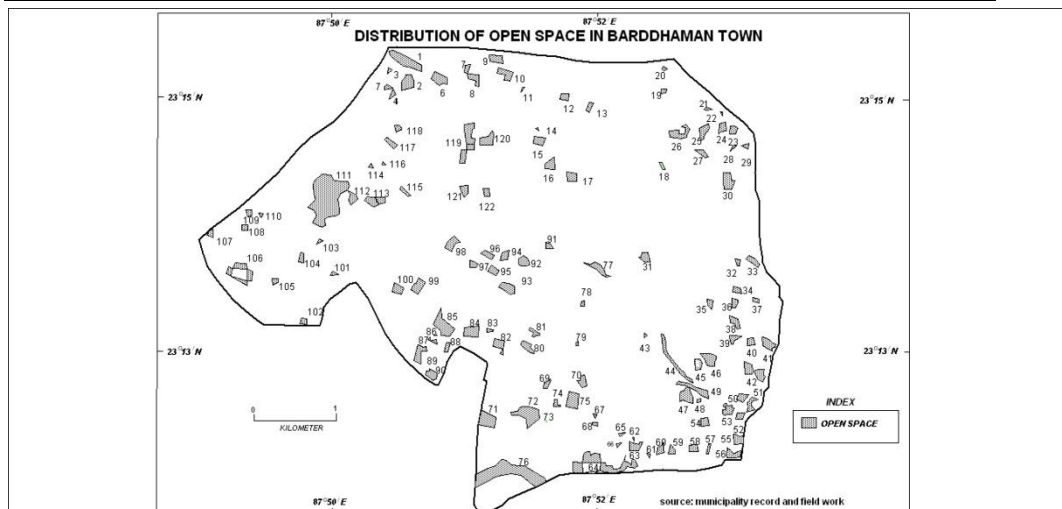


Fig. 3. Distribution of open space in Barddhaman town (Data source: Barddhaman Municipality office, 2011)

Table 2: Classification of open spaces

Area of open space (hectare)	Serial no. of open spaces	Category of open spaces
<1	3,4,5,7,9,11,12,13,14,18,19,20,21,22,23,24,27,28,29,32,33,34,35,36,37,39,40,43,48,50,51,52,54,57,58,59,60,61,62,64,66,67,68,69,73,74,78,79,81,83,84,86,87,88,91,93,94,95,96,97,101,102,103,104,105,107,108,109,110,114,115,116,117,118,121,122	Small
1 to 1.89	8,15,16,17,25,31,38,41,45,49,53,55,56,63,70,77,80,82,89,90,92,98,99,100,112,120	Medium
>1.89	1,2,6,10,26,30,42,44,46,47,64,71,72,75,86,85,106,111,113,119	Large

Note: Category of open spaces has shown in fig.3; computed by the author

In Burdwan town 122 open spaces have been identified among which 20 are of large and rests are small and medium size categories (Table 2). To make the analysis viable we have selected the large sized categories here (Fig.4).

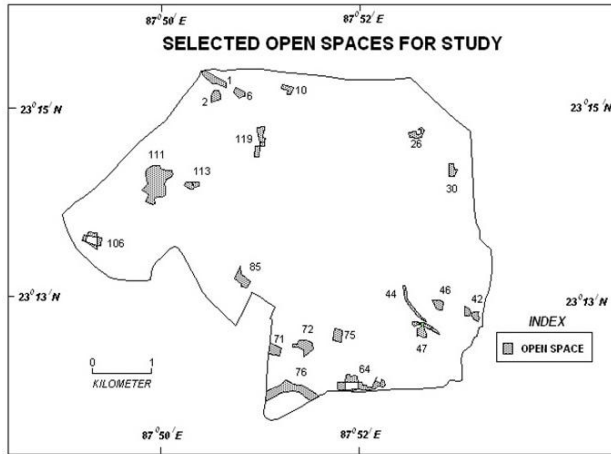


Fig.4 Selected open spaces for the study

IV.3 Distribution pattern of open spaces

The distribution pattern of the town exhibits general pattern as the central part of it (wards: 1,3,8,9,10,14,15,18,20,21,28,29,30,31,32,33,34) has very low (<5%) amount of open spaces in respect to the total percent of the area; ward no(s). 2,4,5,11,17, 19, 22, 23,26,27 and 35 have moderate (5%-15%) amount of it and ward no(s). 6,12,16 and 25 have high percentage of open spaces (>15%) due to their peripheral location in the town (Fig.5).

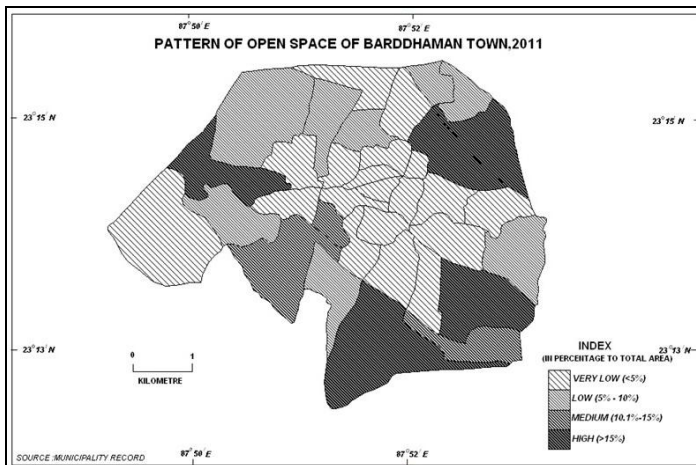


Fig. 5 Pattern of open space of Barddhaman town (2011)

IV.4 Economic and environmental significance of open spaces: A comparative analysis

The selected open spaces (number 20) have been comparatively analysed on the basis of standard scores of the two variables (distance from CBD and area) and their surroundings to explore their economic and environmental significance (Table 3).

Table 3: Standard scores of distance from CBD and area of the open space

Sl. no. of Open Space	Distance from CBD in km. (1)	Standard Score (1)	Area in hectare (2)	Standard Score (2)
1	3.57	0.75	5.18	0.22
2	3.43	0.61	2.59	-0.43
6	3.06	0.24	1.92	-0.60
10	2.41	-0.41	1.9	-0.60
26	0.8	-2.02	2.59	-0.43
30	0.93	-1.89	2.58	-0.43
42	2.45	-0.37	2.5	-0.45
44	1.88	-0.94	2.55	-0.44
46	2.04	-0.78	1.97	-0.58
47	2.33	-0.49	2.6	-0.43
64	3.17	0.35	5.18	0.22
71	3.2	0.38	2.97	-0.33
72	2.91	0.09	5.18	0.22
75	2.51	-0.31	2.47	-0.46
76	3.57	0.75	12.2	1.97
85	2.96	0.14	3.74	-0.14
106	5.15	2.33	2.59	-0.43
111	4.09	1.27	18.13	3.45
113	3.41	0.59	2.07	-0.56
119	2.45	-0.37	5.18	0.22

Considering the hypothesis that greater the distance from CBD economic value of open space decreases whereas, environmental value increases, we have justified the same. The open spaces with negative standard score (1) is economically more and environmentally less valuable than the open spaces with positive standard score (1). Therefore, open spaces with serial no(s). 10, 26, 30, 42, 44, 46, 47 and 75 may be used for economic purposes and open spaces with serial no(s). 1, 2, 6, 64, 71, 72, 76, 85, 106, 113, 111 and 119 may be used for better environmental condition and removal of economic activities from the area. On the other hand, open spaces with positive standard score (2) is economically and environmentally more valuable than the open spaces with negative standard score

(2). Therefore, open spaces with serial no(s). 1, 64, 72, 76, 111 and 119 are more valuable than others.

With the application of this technique local authorities may easily design the open spaces according to their economic and environmental significance.

IV.5 Relation between land value and open space of the town

The relation between land value and open space has found negative in case of Barddhaman town (**Fig. 6**). This implies that the town dwellers are less environmentally aware. But this simplification will deliberately not portray the real situation as there are other variables which may affect the land value. In the following **table 4** an attempt has been made to explore this by calculating the correlation of land value with these variables.

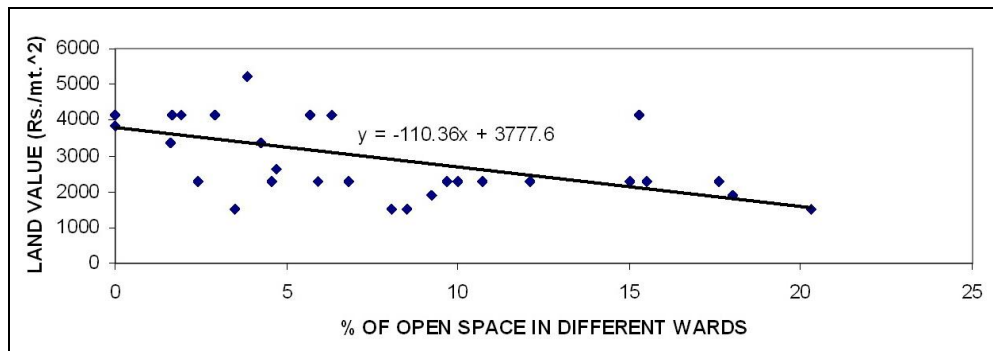


Fig. 6. Correlation between open space and land value in Barddhaman town

Table 5 Influence of variables on land value of the town

Variables	Land value (%)
Influence of commercial, public office and educational Land uses	70
Influence of residential Land use	58
Influence of housing density	48

(data source: filed sourvey, 2011)

The result has shown that land values are positively influenced by the commercial, public office and educational land uses (70%), residential land uses (58%) and housing density (48%) variables. Other variables like proximity to rail station, proximity to bus stand and quality of land etc. are also influencing the land value to a large extent.

IV.6 Suggestive measures for the use of open spaces

On the basis of the results obtained in comparative analysis of the open spaces and examining the surrounding land use pattern, the following recommendations are proposed for designing the open spaces of the Barddhaman town. For this purpose development of urban parks, green spaces have been given prior emphasis because they provide urban people a place to relax, some intangible and immaterial needs that pose emotional and psychological benefit to them. (Table 6).

Table 6: Suggestive measures for the use of open spaces, Barddhaman town

Sl. no of Open Spaces	Area (ha)	Present use	Recommendation
1	5.18	Unused	This open space can be developed as a neighbourhood park to give people a destination for leisure and recreation. It can be maintained by additional activities of plantation in its remaining parts to increase its aesthetic beauty.
2	2.59	Unused	
6	1.92	Unused	
10	1.9	Unused	
26	2.59	Unused	
30	2.58	Unused	
42	2.5	Unused	These may be building up as retail market centres.
44	2.55	Unused	
46	1.97	Unused	The space can be used for economic purposes.
47	2.6	Unused	
64	5.18	Unused	All these open spaces excluding serial no. 75 can be used for development of green space to control soil erosion and modification of micro climate of the area. Local market can be set up at number 75.
71	2.97	Unused	
72	5.18	Unused	
75	2.47	Unused	
76	12.2	Unused	
85	3.74	Unused	This area is characterised by low population density, polluted micro climate, large number of rice mill etc. So if this space can be developed as green space by plantation of vegetation the micro climate can be improved to some extent.
106	2.59	Unused	This area has little green space in its surrounding. So it can be developed as a mini park.
111	18.13	Unused	This is the largest open space located on the northern bank of Banka river. It can be developed as a large common park to control the polluted environment.
113	2.07	Unused	It can be developed as a neighbourhood park to provide people of this crowded area a place to relax.
119	5.18	Playground	Can be maintained by additional activities of plantation in its remaining part to increase its aesthetic beauty.

V. CONCLUDING REMARKS

In concluding remarks it can be said that 'Barddhaman' as its name implies is the growing urban centre of the district and expanded haphazardly in an unplanned way. Therefore, with the application of the aforesaid technique and suggested recommendation future development of the town can be made properly for its economic as well as environmental sustenance in a beautiful way keeping in mind the complex urban matrix also.

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