

Cartography for Sustainable Development: A Case Study of Sagar Island, West Bengal

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ABSTRACT

Majority of the people of India are living in rural areas and this is more so for West Bengal where 72% of the inhabitants live in rural countryside. As a result rural development programmes have been given top priority for India's development.

Sustainable development of rural areas and the people living there may be achieved by improvement of the infrastructural facilities in education, health, transport, trade and commerce, markets and extension services and associated improvement of quality of life. Even today, a vast majority of the inhabitants of the villages are living below poverty line. Thus to improve the socio-economic conditions of the people living in rural areas, it will require a balanced and multidimensional growth to attain sustainable development which may be executed only through inter-disciplinary approach.

Sagar Island is situated near the confluence of the Ganga and the Bay of Bengal 100 km south of Kolkata in the South Twenty-four Parganas district of West Bengal. It is full of creeks and channels, which divide the Block into four large and small islands.

It comprises of 46 villages spread over 504 sq. km of area with a total population of 185630 in 2001, the density of population being 368 persons per sq km. There is a Block Development Office attached with Agricultural Extension Service. Eleven permanent roads connect the villages of which two are most important, one connects Kachuberia in the north to mela ground in the south running through the heart of the island for a distance of 32 km while the other connects Chemaguri in the east central to mela ground in the south for a distance of 10 km.

The basic objectives of this study are:-

1. To examine the existing socio-economic facilities essential for development.
2. To identify the functional gaps of these facilities in different villages.
3. To suggest appropriate recommendations for their removal and integration.
4. To project the future requirements to satisfy the expanding population.
5. To apply appropriate cartographic techniques to execute suitable work plan for sustainable development of the area.

INTRODUCTION

Majority of the people of India are living in rural areas and this is more so for West Bengal where 72% of the inhabitants live in rural countryside. As a result, rural development programmes have been given top priority for India's development.

Sustainable development of rural areas and the people living there may be achieved by improvement of the infrastructural facilities in education, health, transport, trade and commerce, communication and extension services and associated improvement of quality of life. Even today a vast majority of the inhabitants of the villages are living below poverty line. Thus to improve the socio-economic conditions of the people living in rural areas, it will require a balanced and multidimensional growth to attain sustainable development which may be executed only through inter-disciplinary approach.

STUDY AREA

Sagar island is situated near the confluence of the Ganga and the Bay of Bengal, 100 km South of Kolkata in the South Twenty Four Parganas district of West Bengal. It is full of creeks and channels which divide the Block into four large and small islands.

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Group	Variables Selected	Occurrence	Population Served	Score Points
Education	1) Primary School (P)	123	1254	1
	2) Middle School (M)	41	3761	3
	3) High School (H)	15	10280	8
	4) College (C)	1	154200	20
Medical	1) Dispensary (D)	8	11862	5
	2) Health Center (HC)	3	30840	16
	3) Hospital (Hs)	2	77100	20
Communication	1) Post Office (PO)	38	4058	3
	2) Post & Telegraph Office (PTO)	1	154200	20
	3) Phone (PH)	3	51400	16
Extension	1) Metalled Roads (MR)	16	9638	5
	2) Electrified Vill (EV)	12	12850	5
	3) Block Development & Agri Exn Office (BDO)	1	154200	20
Trade & Commerce	1) Markets (MT)	51	3025	3
Transport	1) Bus Stop (BS)	13	9638	5
	2) Bus Terminus (BT)	3	51400	20

Table 1. Score Points for Selected Variables

OBJECTIVES

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METHODOLOGY

Sixteen variables to characterize six groups of socio-economic facilities viz., educational, health, transportation, communication, trade and commerce and extension services

Type	Population Size	Villages	Centrality Scores	Villages
Very High	>5600	6	>50.0	5
High	4200-5600	11	37.5-50.0	6
Moderate	2800-4200	11	25.0-37.5	7
Low	1400-2800	10	12.5-25.0	12
Very low	<1400	9	<12.5	17
Total		47		47

Table 2. Grouping of Villages

	Status	(Residuals)	No.	Percentage	
				Area Served	Population Served
Developed	Highly Developed	(>20)	6	15.23	17.66
	Moderately Developed	(10 to 20)	8	16.71	16.64
	Slightly Developed	(0 to 10)	3	5.86	5.88
Deficient	Slightly Deficient	(-10 to 0)	16	29.35	19.97
	Moderately Deficient	(-20 to -10)	9	18.08	22.04
	Highly Deficient	(<-20)	5	14.77	17.81
Total			47	100.00	100.00

Table 3. Development Status of Villages

have been identified for the study.

The occurrence of each of the variables has been collected village wise by intensive field survey. Weightages of each have been ascertained by comparing the population served by them. The weightages of selected variables for the villages have been added to determine the centrality scores.

Spatial association between population density and the centrality scores has been quantified by correlation and regression analysis. The gap areas have been demarcated by residual mapping and accessibility.

Finally, suggestions have been forwarded to overcome the gap areas for immediate and short term requirements on the basis of projected population for the future.

ANALYSIS OF RESULTS

The score points have been ascertained for each of the sixteen selected variables on the basis of population served by each. For higher order variables, the minimum score points have been fixed at 20.

On the basis of score points of different variables, the centrality scores of the villages of Sagar Island have been calculated by adding the score points of each of the variables obtained by multiplying the score points with their respective occurrences.

Thus the centrality score of any village is the index of supremacy of that village in the study area.

The frequency distribution of the villages on the basis of population size and centrality score has been tabulated for the ease of comparison.

The frequency distribution of the villages on the basis of population size does not agree perfectly with that of centrality scores. The population size is normally distributed while centrality score is negatively skewed. This suggests that the socio-economic variables selected for the study are not properly distributed to serve the population of the villages adequately. In order to ascertain the status of the villages on the basis of surplus and deficiency of the facilities regression analysis has been employed between population size and centrality score. The estimated regression equation computed by least square analysis may be mathematically expressed as :

$$Y_c = 2.17087 + 0.007026X$$

Where Y_c is the estimated centrality score and X is the population size as independent variable

The analysis reveals that the correlation coefficient $r = +0.53934$ which indicates that population size is directly and strongly associated with centrality score.

Functions	Highly Deficient	Moderately Deficient	Slightly Deficient	Total
Six	2	3	7	12
Five	3	5	4	12
Four	-	1	3	4
Three	-	-	1	1
Two	-	-	1	1
Total	5	9	16	30

Table 4. Deficient Villages

The status of the villages has been determined by the residuals of centrality score as explained by population size i.e., by computing the difference between the actual (Y) and estimated (Yc) centrality scores. The villages have been classified as surplus or deficient on the basis of positive or negative residuals (Y-Yc) respectively.

All the villages of Sagar Island have been categorized on the basis of their development status. It is observed that 17 villages are developed where as the majority of the villages (30) are deficient in various facilities. Of the total area only 37.8% serving a population of 40.18% are developed where as 62.8% of the village area inhabited by 59.82% of the population are deficient in some facilities. The deficient villages have been again

classified on the basis of their functional deficiency as follows.

It is observed that 12 villages are deficient in all the six functions in the three deficiency categories. Another 12 villages are deficient in five functions. Four villages are lagging in four functions. Two more villages are deficient in three and two functions each.

STUDY OF GAP AREAS

The gap areas of different higher order variables have been studied by accessibility to the villages as follows :-

All the villages situated at a distance of above 2.50 km from the High Schools and Metalled Roads have been considered to be inaccessible. Similarly, a distance of above 5.00 km from

Variables	Highly Accessible	Moderately Accessible	Inaccessible
High School	<1.25 km	1.25-2.50 km	>2.50 km
College	<5.00 km	5.00-10.00 km	>10.00 km
Hospital/Health Center	<2.50 km	2.50-5.00 km	>5.00 km
Metalled Roads	<1.25 km	1.25-2.50 km	>2.50 km
Bus Terminus	<2.50 km	2.50-5.00 km	>5.00 km
Phones	<2.50 km	2.50-5.00 km	>5.00 km

Table 5. Accessibility Zones

Variables	Serving	High	Moderate	Inaccessible
High School	Villages %	29.79	42.55	27.66
	Area %	29.36	45.14	25.50
	Population %	32.18	46.07	21.75
College	Villages %	29.79	34.04	36.17
	Area %	26.00	34.00	40.00
	Population %	31.12	30.69	38.19
Hospital/Health Care	Villages %	27.66	57.45	14.89
	Area %	29.78	58.85	11.37
	Population %	33.09	57.84	9.07
Metalled Roads	Villages %	29.78	21.28	48.94
	Area %	35.88	20.84	43.28
	Population %	38.56	9.39	52.05
Bus Terminus	Villages %	12.77	27.66	59.57
	Area %	12.12	27.88	60.00
	Population %	15.74	31.11	53.15
Phones	Villages %	17.02	27.66	55.32
	Area %	18.95	28.59	52.46
	Population %	22.27	30.50	47.23

Table 6. Accessibility to Higher Order Variables

the Hospital/Health Centres, Bus Terminus and Phones has identified the villages as inaccessible. Only one College is located in the island, as a result, all villages situated at a distance of above 10 km have been demarcated as inaccessible. The accessibility position of different variables and the area and population covered by each has been presented below.

This study reveals that only about one tenth of the area and population of the villages are not accessible to hospital/health centre. One fourth of the area and population of the villages are not served by high schools, whereas slightly more than one third of the area and population of the villages are not served by high schools, whereas slightly more than one third of the area and population are not accessible to college. About half of the area and population of the villages do not get the facilities of bus terminus.

For sustainable development of the villages of Sagar Island, two types of proposals have been suggested. One deals with immediate requirement and the other short term plan based on estimated population in 2011. The requirement of selected facilities are as follows :

CONCLUSION

The major findings of the present investigation may be summarized below:

- 1) Only 38% of the area covering a population of 40% of Sagar Island are developed indicating that more than 60% of the area and population are backward.
- 2) That the higher order socio-economic facilities

are inadequate to serve the area and population of this island.

- 3) Immediate requirements of socio-economic facilities are generally low and mostly restricted to lower order variables, particularly in education, communication and extension services.
- 4) In case of short term requirements all the facilities- education, medical, communication, transport, trade and commerce and extension are to be developed and upgraded as these are inadequate to serve the expanding population of the island.
- 5) The growth of population is very low due to its detached location from the mainland of West Bengal causing a slow development of the island.

REFERENCES

Berry, B.J.L. (1964) "Approach to Regional Analysis, a Synthesis"- Annals of the Association of American Geographers, Vol-54 pp 2-11.

Betal, H.R. and A.K. Roy (1997) "Sustainable Development of Jagat Ballabhpur, Hawarah" Indian Cartographer, Vol-17, Chandigarh.

King, L.J. (1978) "Statistical Analysis in Geography" Prentice Hall, N.J.

Pathak, C.R. (1975) " District Development Planning in India" Indian Journal of Regional Science, Vol-7, pp 188-194

Variables	Immediate	Short term	Total
Primary School	26	30	56
Middle School	9	10	19
High School	4	4	8
College	-	1	1
Dispensary	7	4	11
Health Center	3	2	5
Hospital	-	1	1
Post Office	8	10	18
Post & Telegraph	1	1	2
Phone	1	1	2
Bus Stop	6	4	10
Bus Terminus	1	1	2
Markets	11	9	20
Electrified Vill	8	8	16
Metalled Road	6	10	16
BDO/AEO	-	-	0

Table7. Requirement of Facilities