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# Spatial Inequalities in Accessibility of Public Amenities in Jodhpur City

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**Abstract**: A broad range of socio-economic inequalities are commonly appear in the Indian cities. Such an undesirable occurrence reflect on the spatial variation of quality of life. The paper shows the ward-wise inequality in the distribution and accessibility of public amenities in a Jodhpur city. Inequality in the study area evident in the form of unequal provision of urban amenities within city. Provision of two urban amenities i.e. education and, health facility were studied. The Z-score was then used to determine the spatial pattern of provision of the two facilities in this study. The results of the analysis showed that inequalities exist in the provision of accessibility of education and health facility in study area. The paper suggests that local planning authority must keep pace with the urban sprawl in order to make certain the equitable distribution of public amenities in the city.

**Keywords**: Spatial, Public Amenities, Inequalities, Z-score, GIS.

## I. INTRODUCTION

This Urbanization is an index of change from traditional rural economy to modern industrial one. It is a progressive concentration of population in urban unit. At the moment, India is one among the country of low level of urbanization. During the last fifty years the population of India has grown two-and-a-half times, but urban India has grown nearly five times. India is at an acceleration stage of the process of urbanization and expected to increase to over 400 million and 533 million by the years 2011 and 2021 respectively. The increasing level of urbanization growth has created many environmental problems which threaten urban life in the most of developing countries. Spatial techniques are used worldwide for urban facility management. The access to basic amenities like electricity, drinking water, toilet facility, sanitation, health care facilities and solid waste management are critical determinants of urban quality of life (Bhagat, 2010). Inequalities in access to social infrastructures may also be as a result of inefficiency in the distribution and allocation of facilities between areas or as a result of social barriers like ethnicity, religion or status which may directly limit certain groups from having access to public facilities. This is a prominent characteristic of a capitalist economy (Stevenson, 2004).

## II. STUDY AREA

Jodhpur, one of the largest district of Rajasthan states is centrally situated in western region of the state. Jodhpur city is located at 26ºN 18' latitude and 73º E 04' longitude and at an average altitude of 224m above mean sea level. In general the contours are falling from North to South and from North to Southeast with maximum level of 370m and minimum of 210m. The present population is about 1.05 million and has been functioning as one of the engines powering the Indian economy. The location map of the study if given in Fig.1.

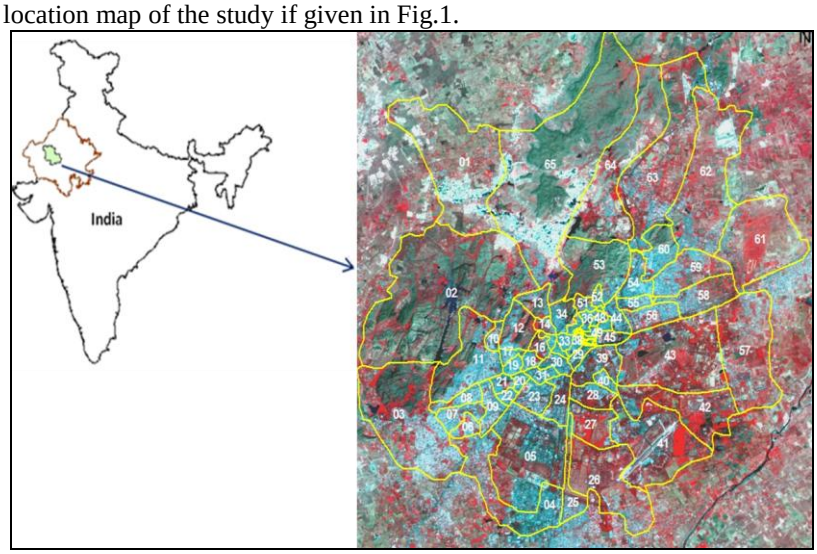


Fig.1 Jodhpur City Wards (65) on Satellite Image.


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## III. DATA AND RESEARCH METHODOLOGY

The data used for this study were obtained from both primary and secondary sources. Data linking to population of each ward, number of schools, and number of health facility and master plan of Jodhpur were collected from the local authorities. The spatial data include the spatial distribution of the various urban amenity from GCP Field Survey. . The attribute data on the other hand consists of specific attributes of each feature. The Landsat satellite image of the study area was geo-referenced with topographic maps. In order to accomplish the objectives taken for the study, the methodology has been divided into two branches (Fig.2). Image processing software ENVI is used for satellite data enhancement and making it suitable for interpretation. The enhanced product used in ArcGis platform for interpretation and digitization. ArcGIS9.2 is used for image interpretation and onscreen data capture, base map and geodatabase generation.

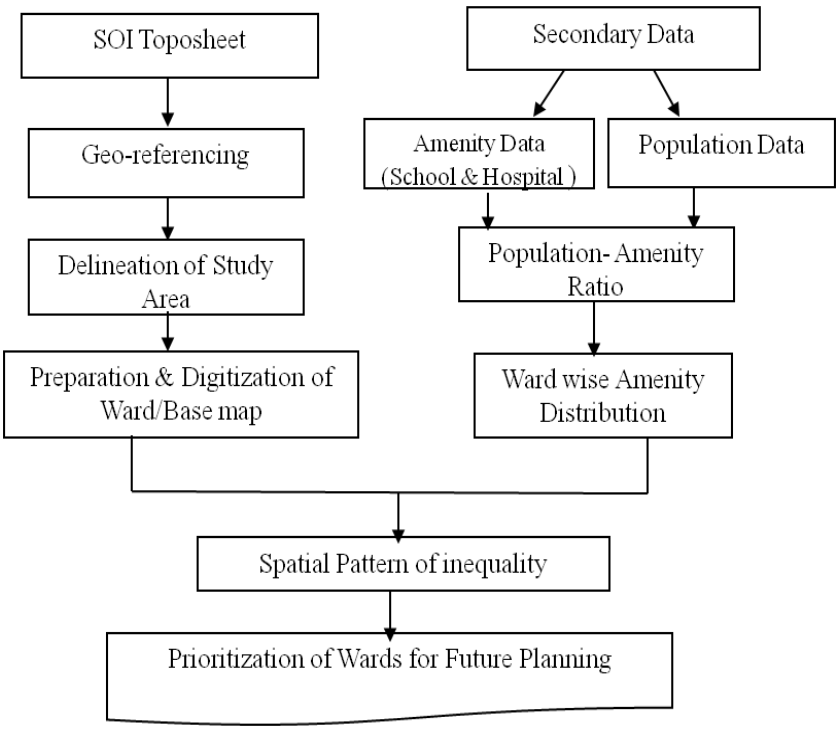


Fig.2. Methodology Adopted.

## IV. RESULTS AND DISCUSSION

*A. Planning for Provision of Urban Amenities*

Prioritization of wards for the provision of urban amenities has been done on the basis of composite index in order to show up the wards with acute shortage of different civic amenities. The wards with low composite score face lack of services while as the wards with high composite index value are possessing adequate facilities. The composite index was divided into five groups and treated in a GIS environment to get the prioritization map. In this study, standardized score technique (Z-score) was used to determine the spatial pattern of provision of the two facilities. The Z-score is widely used (Aderamo and Aina, 2011; Fabiyi, 2011) to analyse spatial pattern of distribution of facilities. The model for the study is stated below:-

Z-score formula:- $$Z_i = \frac{X - \bar{X}}{SD}$$

Where Zi = standardized score for the ith observation, X = the original of the ith observation

$\bar{X}$ = the mean of the value X variable ,SD = the standard deviation of the X variable and

$$SD = \sqrt{\frac{\Sigma(X-\bar{X})^2}{N}}$$ Where N = Total number of observation

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*B. Spatial Pattern of Inequalities in the Distribution of Amenities*

The Z-score has been used to analyze the degree of spatial variation in the distribution of public amenities in Jodhpur City. Z-score variation has been used extensively in geographic research (see Johnston, 1980; Oyebanji, 1986). The standardized scores on spatial pattern of educational and healthcare amenities is calculated (Table-1). The standardized scores of amenities have been divided into five groups to determine the relative concentration of amenities across the wards (Fig.3a-c).

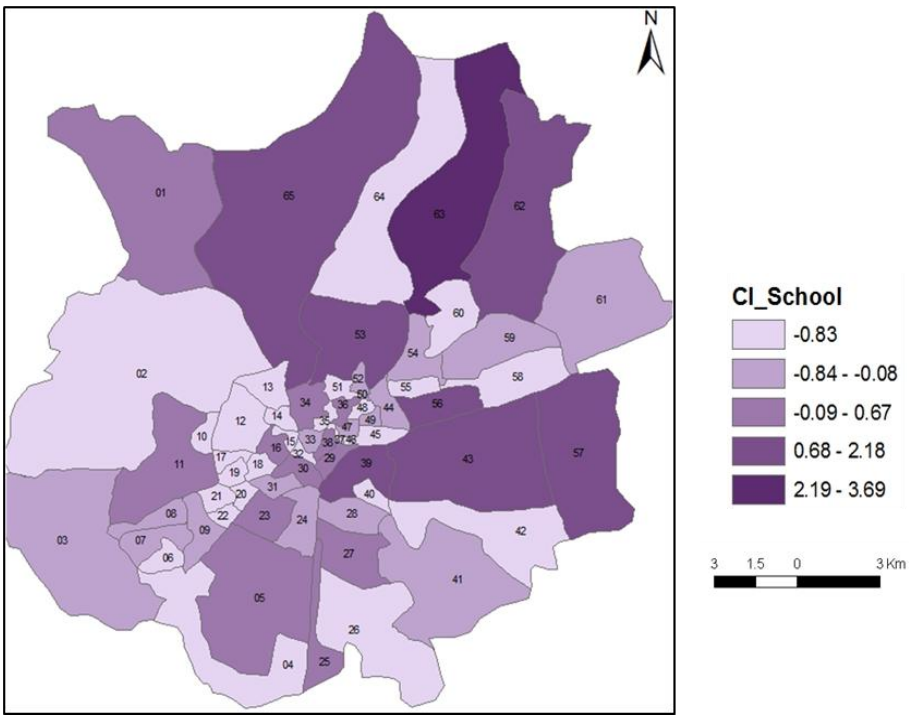


Fig. 3(a) Standardized Composite Scores on School.

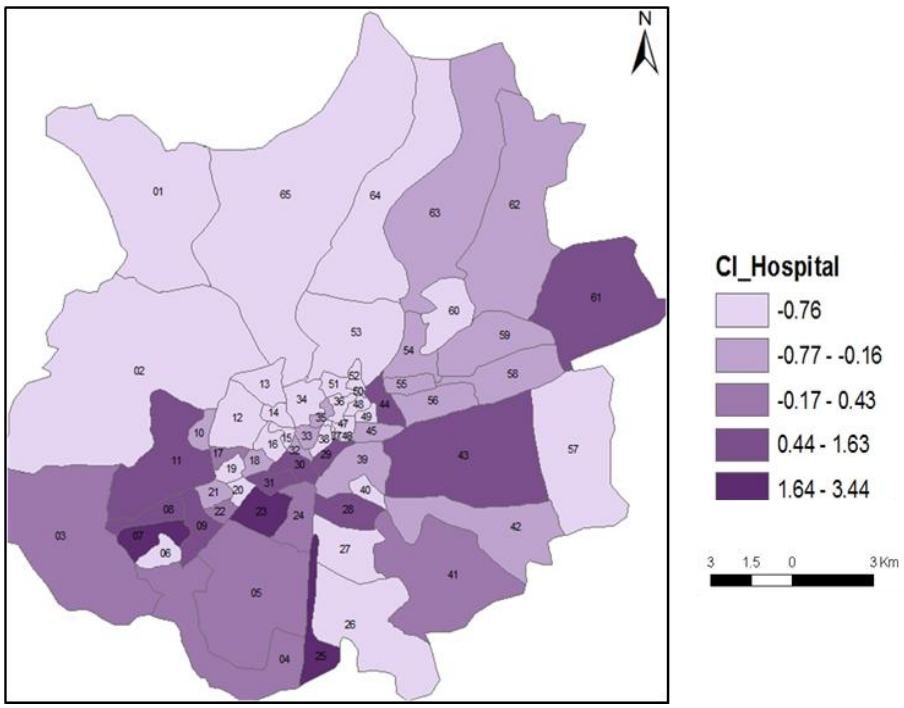


Fig. 3(b) Standardized Composite Scores on Hospital Facility.

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The standardized scores of each amenity have been added to get the composite indicator of the amenities to reflect overall degree of inequality in the provision of the selected amenities (Fig.3c).

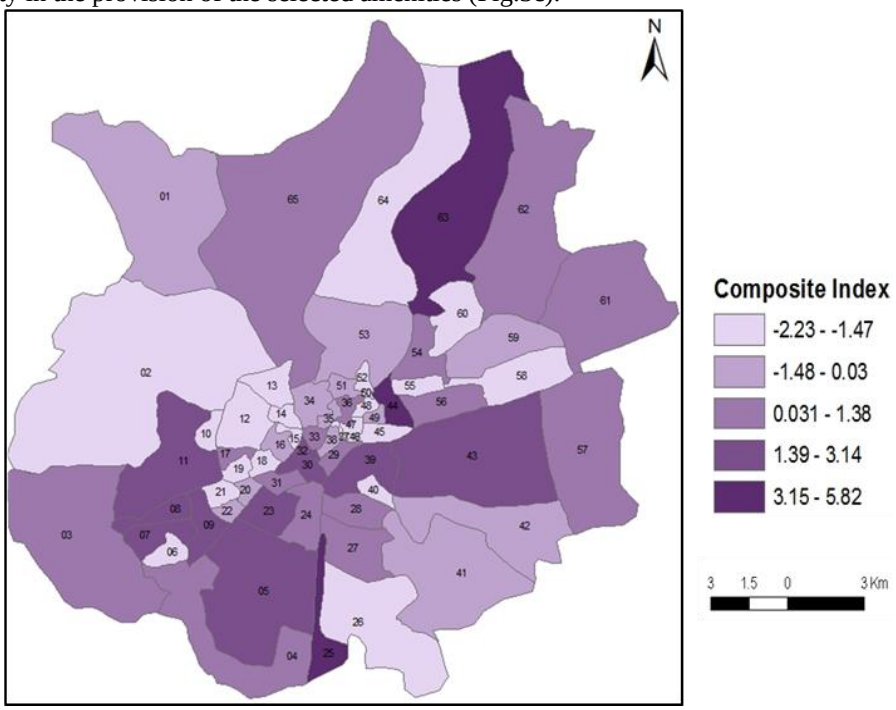


Fig. 3(c) Standardized Composite Scores on Social Amenities.

## V. CONCLUSION

The study shows that the public amenities i.e. schools and health facility are not uniform in their spatial occurrence among different wards, which leads to various problems like alienation of people towards local government, interpersonal disparities in standards of life and deterioration of city environment. The analysis of spatial inequalities in accessibility of two public amenities in Jodhpur city, indicates that there is a lead-lag relationship among different wards in terms of the provision of urban amenities. Some wards are more developed in terms of a particular facility while others lag far behind the mean level of development of the city in terms of that facility. The reasons for the disparity are the lack of urban policy for Jodhpur city resulted in the unplanned urban structures which also led to an jagged distribution of these amenities. Participatory approach is needed for ensuring the even distribution of urban amenities in Jodhpur city.

TABLE-1. Composite Index (CI) of Public Amenities

| Ward No. | Hospital CI | School CI | Composite Index |
|---|---|---|---|
| 1 | -0.767802 | 0.673781201 | -0.723845797 |
| 2 | -0.767802 | -0.83641804 | -2.234045041 |
| 3 | 0.43477942 | -0.08131842 | 1.185729803 |
| 4 | 0.43477942 | -0.83641804 | 0.430630182 |
| 5 | 0.43477942 | 0.673781201 | 1.940829425 |
| 6 | -0.767802 | -0.83641804 | -2.234045041 |
| 7 | 3.44123288 | -0.08131842 | 2.73008942 |
| 8 | 1.03607011 | -0.08131842 | 1.787020495 |
| 9 | 1.63736081 | -0.08131842 | 2.388311186 |
| 10 | -0.1665113 | -0.83641804 | -1.63275435 |
| 11 | 1.63736081 | 0.673781201 | 3.143410807 |
| 12 | -0.767802 | -0.83641804 | -2.234045041 |
| 13 | -0.767802 | -0.83641804 | -2.234045041 |
| 14 | -0.767802 | -0.83641804 | -2.234045041 |
| 15 | -0.767802 | -0.83641804 | -2.234045041 |
| 16 | -0.767802 | 0.673781201 | -0.723845797 |
| 17 | 0.43477942 | -0.83641804 | 0.430630182 |


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| | | | |
|---|---|---|---|
| 18 | -0.1665113 | -0.83641804 | -1.63275435 |
| 19 | -0.767802 | -0.83641804 | -2.234045041 |
| 20 | -0.767802 | -0.83641804 | -0.771951201 |
| 21 | -0.1665113 | -0.83641804 | -1.63275435 |
| 22 | 0.43477942 | -0.83641804 | -1.031463658 |
| 23 | 2.83994219 | 0.673781201 | 2.88389835 |
| 24 | 0.43477942 | -0.08131842 | 1.185729803 |
| 25 | 2.83994219 | 0.673781201 | 4.34599219 |
| 26 | -0.767802 | -0.83641804 | -2.234045041 |
| 27 | -0.767802 | 0.673781201 | 0.738248042 |
| 28 | 1.63736081 | -0.08131842 | 0.926217346 |
| 29 | 1.03607011 | 0.673781201 | 1.080026276 |
| 30 | 1.03607011 | 0.673781201 | 2.542120116 |
| 31 | 1.03607011 | -0.08131842 | 0.324926655 |
| 32 | -0.1665113 | -0.83641804 | 2.75352717 |
| 33 | -0.1665113 | -0.08131842 | 0.584439112 |
| 34 | -0.767802 | 0.673781201 | -0.723845797 |
| 35 | -0.1665113 | -0.83641804 | -0.17066051 |
| 36 | -0.767802 | 0.673781201 | 0.738248042 |
| 37 | -0.767802 | -0.83641804 | -2.234045041 |
| 38 | -0.767802 | 0.673781201 | -0.723845797 |
| 39 | -0.1665113 | 2.183980444 | 2.849737977 |
| 40 | -0.767802 | -0.83641804 | -2.234045041 |
| 41 | 0.43477942 | -0.08131842 | -0.276364037 |
| 42 | -0.1665113 | -0.83641804 | -0.17066051 |
| 43 | 1.03607011 | 1.428880822 | 1.835125898 |
| 44 | 1.03607011 | -0.08131842 | 4.711208174 |
| 45 | -0.1665113 | -0.83641804 | -1.63275435 |
| 46 | -0.767802 | -0.83641804 | -2.234045041 |
| 47 | -0.767802 | -0.08131842 | -1.478945419 |
| 48 | -0.767802 | -0.83641804 | -2.234045041 |
| 49 | -0.767802 | -0.08131842 | -0.016851579 |
| 50 | -0.767802 | -0.08131842 | -1.478945419 |
| 51 | -0.767802 | -0.83641804 | -0.771951201 |
| 52 | -0.767802 | -0.08131842 | -1.478945419 |
| 53 | -0.767802 | 1.428880822 | 0.031253824 |
| 54 | -0.1665113 | -0.08131842 | 0.584439112 |
| 55 | -0.1665113 | -0.83641804 | -1.63275435 |
| 56 | -0.1665113 | 1.428880822 | 0.632544515 |
| 57 | -0.767802 | 2.183980444 | 0.786353446 |
| 58 | -0.1665113 | -0.83641804 | -1.63275435 |
| 59 | -0.1665113 | -0.08131842 | -0.877654728 |
| 60 | -0.767802 | -0.83641804 | -2.234045041 |
| 61 | 1.63736081 | -0.08131842 | 0.926217346 |
| 62 | -0.1665113 | 2.183980444 | 1.387644137 |
| 63 | -0.1665113 | 3.694179687 | 5.82203106 |
| 64 | -0.767802 | -0.83641804 | -2.234045041 |
| 65 | -0.767802 | 2.183980444 | 0.786353446 |

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