Urban Sub —Areas in a Planned State Capital, Bhubaneshwar

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Abstract : *This paper attempts to identify urban sub-areas in Bhubaneshwar, India's first modern planned state capital, using three variables closely associated with its planned nature and administrative function, namely, literacy, sex ratio and workforce. The sub-areas have been identified and compared over two time periods, 1971, when the city was at a nascent stage of development, and 1991, when Bhubaneshwar emerged as Orissa's largest city. The relationship among these variables has also been described in order to understand the changes in the socio-economic characteristics of population, and the relative importance of these three attributes as the city has developed. Further, the distribution of such additional variables as female literacy, female workers and Scheduled Castes population, has been investigated in order to understand the socio-spatial patterns in Bhubaneshwar.*

Introduction

The dynamics of social structure and organization, as reflected through patterns of concentration of socio–economic attributes of population in different parts of cities, have formed a well recognized basis for the identification and classification of urban sub – areas, variously termed as morphological sub-areas, natural areas and neighbourhoods. The concept of urban sub–areas recognises the fact that 'within the overall residential structure of the city, there exist comparatively homogeneous sub–divisions, which are characterised by an internal consistency and by a personality which distinguishes them from other parts of the city'.

Objective

The general pattern of urban sub–areas in Indian cities, a majority of which have evolved over a long period of time, has been well documented.

In comparison to evolved towns, planned cities, such as Bhubaneshwar, represent a more contemporary socio–spatial context. Firstly, these cities have grown at a phenomenal pace over a short span of time. Secondly, and more importantly, both the growth and the operation of socio–economic processes in these cities has taken place within the confines of a detailed plan framework. In order words, the plan proposals have played a major role in determining the pattern of distribution and concentration of population. Given these qualifying conditions, the development of sub–areas and their characteristics in such planned cities as Bhubaneshwar provides an interesting theme of research, and forms the objective of this study.

The Study Area

Bhubaneshwar has the distinction of being India's first modern planned state capital. The city is located adjacent to the ancient temple town of the same name, and is 29 km to the south of Cuttack, Orissa's traditional premier city and 66 km southeast of Puri, a prominent center of Hindu pilgrimage. The search for a new capital for Orissa dates back to 1935, when the state was constituted as a province of British India. The decision to build a new capital city rather than append the administrative function to the existing large towns, for example, Cuttack or Puri, was borne out of such practical consideration as lack of adequate space as well as strong regional sentiments, for example, a revival of the Kalinga spirit. However, it was only a decade later, in 1945, that the present site of Bhubaneshwar was agreed upon. In late 1947, Otto Koenigsberger, the then Chief Architect and Town Planner of Mysore state was invited to prepare a plan for the city. Koenigsberger had been in India

since 1939, and had worked on several development projects including the replanning of Jamshedpur.

The plan of Bhubaneshwar was prepared in accordance with the canons of the then contemporary western town planning thought, namely (a) functional segregation of land uses, (b) use of neighbourhood units as the basic spatial unit in the plan, and (c) traffic separation through a hierarchy of roads. Koenigsberger planned Bhubaneshwar on a leaf –like pattern, with six units attached to one main artery, later called the Sachivalaya Marg. Additional units were to be added as the city developed. Initially the city was planned for a population of 20,000 persons, but this projected size was later doubled to 40,000 persons.

Since its formal establishment in 1948, Bhubaneshwar has grown rapidly. Within a span of four decades, it succeeded in emerging out of Cuttack's shadow, and in 1991 was Orissa's largest city (population 411,542 persons). In 2001, it has maintained this rank with a population of 647,302 persons. Functionally, the city has evolved from being an administrative center to a regional center of education, commerce and business, with a growing industrial presence. Currently, it is a tehsil headquarters in Khordha district.

Methodology and Sources of Data

The basic methodology for identification of urban sub-areas, Social Area Analysis, was proposed by Shevky and Bell in 1955. This technique sought to identify variations in social space, which were expected to be translated on to geographical space. They maintained that such variations had three main expressions, which they termed constructs–social rank, urbanization and segregation. These constructs were statistically measured from census data using diagnostic variables, and were then combined to form the criteria for identification of sub–areas. Subsequently, more sophisticated

methods using multi–variate and factor analysis were used to identify the urban spatial structure.

It is however, necessary to adapt the technique and constructs of Social Area Analysis to the Indian situation, partly on account of differing socio–economic contexts, and partly because of the non–availability of data regarding some indicators at the desired scale of analysis, for example, data regarding fertility among women in the reproductive age group at the ward level.

In this study, therefore, three indicators- literacy, sex ratio and work force–have been selected for identification of urban sub–areas in Bhubaneshwar. The choice of indicators is justified by the nature of functions planned for the city: literacy, as a basic pre–requisite for the administrative function: sex ratio, since provision of government accommodation was a basic element in the plan of the state capital, and work force, given the kind of function Bhubaneshwar was planned to perform and the functions it was subsequently excepted to attract.

To understand the inter–relationship among these indicators, multi–collinearity has been computed for the two time periods, 1971 and 1991 (table 1). The identification of sub–areas in Bhubaneshwar city is based on the computation of concentration indices for the three indicators for the two time periods.

Table 1: Multi–Collinearity between Literacy, Sex Ratio And Workforce (1971 and 1991)

	Literacy	Sex Ratio	Workforce
Literacy	—	- 0.58 (0.01) *- 0.20 (NS)*	+ 0.09 (NS) *- 0.04 (NS)*
Sex Ratio	—	—	- 0.38 (NS) *- 0.48 (0.01)*
Workforce	—	—	—

Note : 1 Figures in italics refer to values for 1991
2 Figures in brackets indicate levels of confidence
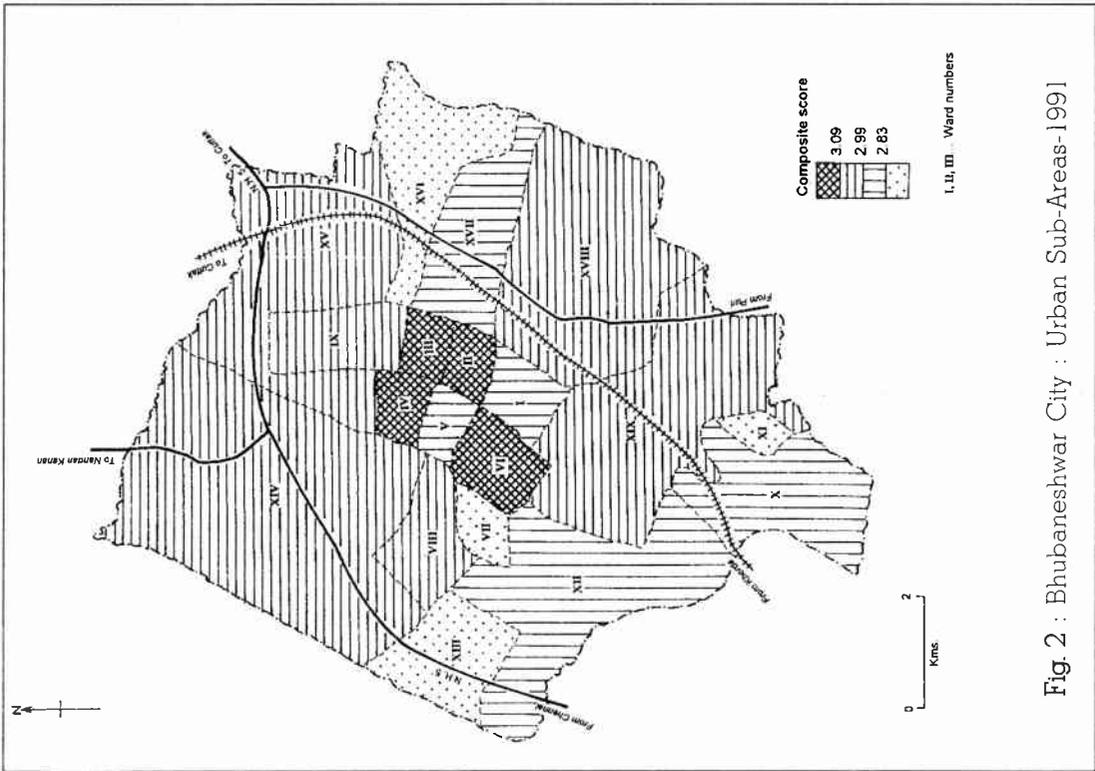3 NS = Not Significant

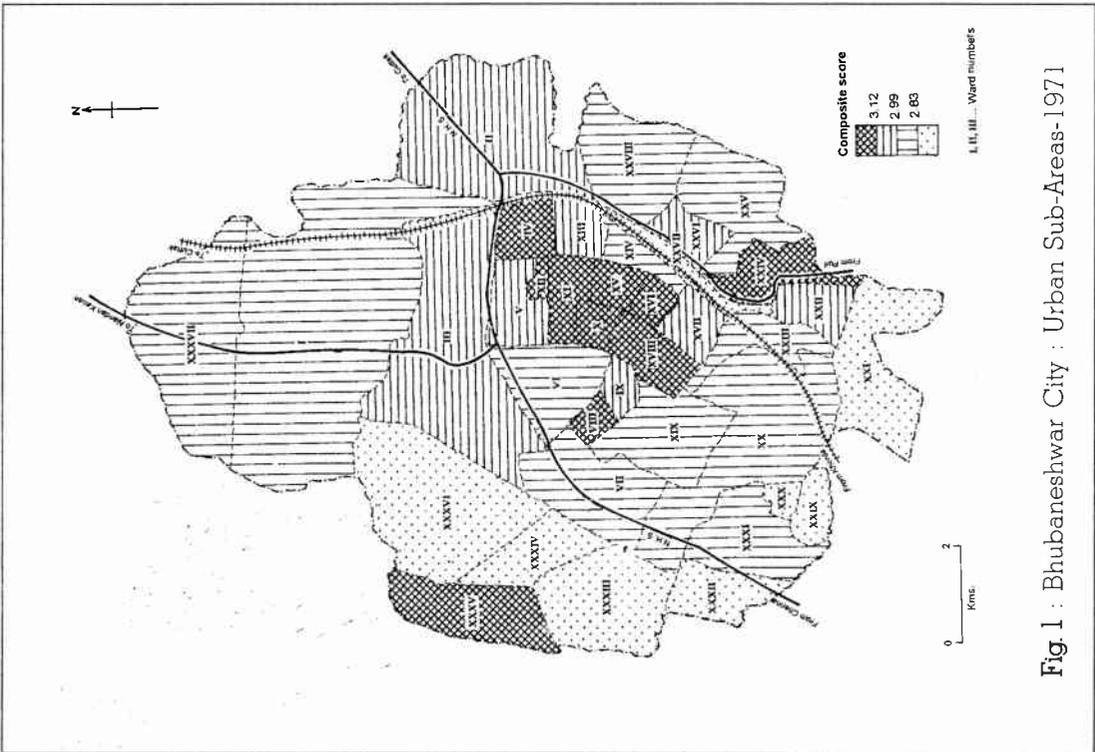Fig. 2 : Bhubaneshwar City : Urban Sub-Areas-1991

Fig. 1 : Bhubaneshwar City : Urban Sub-Areas-1971

These indices were then cumulated to obtain a composite score for individual wards, and the median value was used to define sub-areas for 1971 and 1991 (Figures 1 and 2). In addition, the proportion of female literate, female workers and Scheduled Caste population were also computed for a better understanding of the social milieu of the identified sub-areas (Table 2).

The data used in this paper have been obtained from the District Census handbooks of Puri for 1971 and 1991.

The Changing Dynamics of Socio — Economic Attributes

The associations between the three selected variables in 1971 and 1991 can be identified from table 1. Broadly, the correlations are not in conformity with the expected trend of a positive and significant relationship among the three indicators.

In 1971, literacy had a negative relationship with sex ratio, which was significant at a fairly high level of confidence ($r = 0.01$). This could be expected in a city experiencing a fast pace of development and expansion in this function, resulting in higher levels of employment for males and restricted opportunities for female employment as well as family type living. In comparison, even though the relationship between literacy and work force was positive and significant, sex ratio had negative weak relationship with workforce in 1971.

Two decades later, in 1991, the relationship between literacy and sex-ratio improved, although it continued to be negative. This trend suggests that the future development of the city would possibly result in a further improvement in the association of these two variables, particularly since the levels of sex-ratio are closely related to the availability of a conducive residential and infrastructural environment. In comparison, the correlation of both literacy and sex ratio with workforce further weakened, indicating the nature of changes in the socio-economic character of the city population.

Spatial Pattern, 1971

On the basis of the composite index values for literacy, sex ratio and workforce, the following four sub-areas have been identified in Bhubaneshwar (Fig. 1):

(i) Areas With Very High Score (More Than 3.09):

This category includes Wards 2, 3, 4 and 6 located in the heart of Bhubaneshwar on either side of city's main artery, Sachivalaya

Table 2 : Distribution of Select Attributes (1971 &1991)

Zone	Population	Sex Ratio	literacy	Female Literacy	Workers	Female workers	Scheduled Castes popu.
I	19.85	751	74.81	68.57	29.79	04.29	02.08
	21.41	779	78.17	74.65	33.40	09.84	06.27
II	53.69	715	62.06	49.98	33.56	05.38	07.98
	28.61	727	72.27	65.84	33.38	07.38	07.27
III	16.59	760	53.69	41.14	31.45	04.71	08.68
	40.54	748	67.54	60.12	31.97	07.35	07.89
IV	09.87	664	52.26	30.27	29.49	03.20	10.09
	09.45	788	54.33	43.37	30.72	08.75	14.69

Note: 1 Figures in italics refer to values for 1991.
2 All values are percentage figures, except Sex Ratio, which refers to females per 1000 Males.

Marg. These Wards, formed by Ashoka Nagar, Kharbela Nagar, Bhouma Nagar and Ganga Nagar respectively, comprise four out of the six units initially planned by Koenigsberger. In 1971, this sub–area accounted for 19.85 per cent of Bhubaneshwar's population (Table 2). Socio – economically, the population of this zone comprised of high proportion of literates (47.81%), a high sex–ratio (751 females per 1000 males), but a moderate proportion of workers (29.79%). The latter two attributes suggest a well-developed residential environment, conducive for family type living. The Wards in this sub–area had a predominance of government housing in 1971. The proportion of female literates (68.57%) was the highest in the city. In comparison, the proportion of female workers (4.29%) was one of the lowest in the city. The proportion of Scheduled Caste population in this zone was low (2.08%), a common characteristic of the central areas of a majority of Indian cities.

Functionally, the main locational advantage of this sub–areas is proximity to the city's main work area, the Capital Complex, located in Keshari Nagar (Ward 5), the Utkal University and its campus, known as Vani Vihar (Ward 15) and the Orissa University of Agriculture and Technology (OUAT) in ward 19. In addition, two important institutions, the Capital Hospital and the Homeopathic College and Hospital, are located within this sub–area in Ganga Nagar (Ward 6) and Kharbela Nagar (Ward 3) respectively.

(ii) Areas With High Score (between 2.99 and 3.09) :

This sub–area consists of two contiguous zones, Wards 8, 9, 14 and 15, located in the north and northwest, and Wards 18 and 19, located in the southeast of the city. In 1971, this zone accounted for more than half of Bhubaneshwar's population (53.69%). As compared to the inner zone, this sub–area registered significantly lower values of literacy, female literacy and sex ratio (Table 2). The proportion of workers, including female

workers, however, was the highest in the city (33.56% and 5.38% respectively). This zone also recorded a significantly higher proportion of Scheduled Caste population (7.98%) as compared to the inner zone, which was expected given the peripheral location of a majority of its constituent Wards.

The two zones comprising this sub–area differ from each other in terms of nature of development. Wards 8, 9, 14 and 15 comprise newly developed planned residential areas such as Madhusudan Nagar, Bhoi Nagar and Acharya Vihar, institutional areas such as Vani Vihar and industrial estates such as Mancheshwar. In comparison, Wards 18 and 19 are formed by the old pre–planned Bhubaneshwar town in the southeast of the city. The difference in the nature of development of these two areas is reflected in the socio-economic characteristics of their populations. The former recorded a low sex ratio (696 females per 1000 males), a high literacy and workforce rate (64.3 and 33.68% respectively), and a low proportion of Scheduled Caste population (5.65%). In comparison, the latter area, located around the old city, recorded a significantly higher sex ratio (739 females per 1000 males), but lower literacy rates (59.18%), and although the proportion of workers was comparable to the former area (33.41%), this zone had nearly double the proportion of Scheduled Castes population (10.86%).

(iii)Areas With Low Score (Between 2.83 and 2.99):

This zone includes Wards 1, 5, 10, 12 and 17, which covers a large patch in the southwest of the city and an almost linear belt in the eastern half. This sub–area accounted for 16.59 per cent of Bhubaneshwar's population in 1971. It registered the highest sex ratio in the city (760 females per 1000 males). The proportion of workers, including female workers was only marginally lower than the second sub–area, but the level of literate population was much lower (Table 2). The levels of sex ratio

and workforce, along with a low literacy rate (53.69%) reflect the functional character of this sub-area in 1971. The proportion of Scheduled Caste population in this zone was higher than the two inner zones (8.68%).

Within this sub-area Wards 1 and 5, comprised of Bapuji Nagar and Keshari Nagar respectively, are located in the heart of the city, and were among the initial six units planned by Koenigsberger. These two units house the two main work areas of the city, the Capital Market (Ward 1) and the Capital Complex, comprising the Secretariate and Legislative Assembly (Ward 5). The functional and planned character of these two Wards is reflected in such characteristics as a fairly high literacy rate (66.81%) and a low Scheduled Caste population (5.13%). In comparison, Wards 10 and 12 in the south-west comprise of former villages that were enumerated for the first time in 1971, and Ward 17 in the east forms a part of the pre-planned area of the town. The peripheral location, pre-planned and rural character of these Wards is reflected in such attributes as a high sex ratio (779 females per 1000 males), low rates of literacy (47.33%), high proportion of Scheduled Caste population (10.40%), and concentration of workers comparable to other parts.

(iv) Areas With Very Low Score (Less than 2.83) :

This category comprises of four Wards, numbers 7, 11, 13, and 16 scattered in different parts of the city (Fig. 1). This zone accounted for 9.87 per cent of Bhubaneshwar's population in 1971, the lowest among the four identified zones. It also had lowest levels of sex ratio, literacy, female literacy, workers and female workers (Table 2). In comparison the proportion of Scheduled Castes population (10.09%) was the highest in the city.

Within this sub-area, Ward 7, comprised of Surya Nagar, was among the additional units which developed adjoining the initial six units, and forms part of the planned central area of

Bhubaneshwar. Its planned nature is attested by its very high levels of literacy (80.8%). However, because of the early stage in the development of government housing, it registered the lowest sex ratio (256 females per 1000 males), suggesting the dominating presence of single male government employees. In comparison, Ward 11 in the south comprises part of the pre-planned ancient temple town. Its relatively longer period of settlement and functional character is evidenced in its high sex ratio (932 female per 1000 males), high proportion of Scheduled Caste population (17%), low literacy rate (44.36%) and comparatively low concentration of workers (26%). Ward 13 and 16 were enumerated for the first time as urban areas in 1971 census. Among the two, industry forms the main function of Ward 16, located in the east. This is reflected both in the high proportion of workers (34%) and in its workforce structure which was dominated by workers in 'Manufacturing other than Household Industry'. In comparison, 'Agricultural Labourers' dominated the workforce structure of Ward 13, in the east, attesting to its essentially rural character.

Spatial Patterns, 1991

In 1991, the following four sub-areas have been identified in Bhubaneshwar on the basis of the composite index of literacy, sex ratio and workforce (Fig 2):

(i) Areas With very High Score (More than 3.12) :

This sub-area comprises of Wards 4, 8, 10, 11, 12, 15, 16, 18, 24 and 35. Except for Wards 24 and 35, which are located on the southern and western peripheries of the city respectively, all the Wards form the initial six planned units and can be considered as comprising the core of the city (Fig. 2). Most of this area had registered a high score in 1971 as well. In 1991, this sub-area accounted for 21.41 per cent of Bhubaneshwar's

population (Table 2). The proportion of total literates (78.17%) and total workers (33.40%) were the highest in the city. The sex ratio (779 females per 1000 males) was also high. And additional feature was that while the proportion of female literates (74.65%) continued to be the highest in the city, that of female workers (9.84%) was also the highest in the city. These figures suggest a well developed residential infrastructural environment. In keeping with the well established general pattern, the proportion of Scheduled Caste population continued to be the lowest in the city (6.27%).

Within this category, the centrally located Wards include important residential neighbourhoods, such as Bhauma Nagar and shahid Nagar, and also house major work areas of the city, such as government offices (e.g., the Capital Complex), educational institutions, and commercial and business offices that have developed since the 1980s (for example, IDCO and IPICOL Towers on Janpath). Ward 35 on the western periphery of Bhubaneshwar, which includes village Sampur, was enumerated for the first time as an urban area in 1991. Its socio–economic characteristics are largely rural in character and contrast with the general structure of this sub–area, for example, an extremely high sex ratio (1062 females per 1000 males), a high proportion of workers (36%), a low literacy rate (49%), and a high proportion of Scheduled Caste population (27.53%). In comparison, except for its location around the old town in the southeast of Bhubaneshwar, and existence before the present planned city came up, the socio–economic attributes of population in Ward 24 are comparable to those in the central Wards.

(ii) Areas With High Score (Between 2.99 and 3.12) :

This category includes Wards 2, 3, 5, 9, 13, 17, 22 and 26. Except for Ward 26, these lie contiguous to the Wards having very high score, and except for Wards 22 and 26, the others adjoin the central Wards of Bhubaneshwar's City (Fig. 2). In 1991, this sub–area accounted for 28.61 per cent of Bhubaneshwar's population, the second highest among the four sub–areas. The level of literacy was also the second highest (72.27%), and the proportion of workers was almost comparable to that in the core (33.38%). In comparison, the level of female literacy and female workers were much lower as compared to the central areas. Interestingly, this sub–area recorded the lowest sex ratio among the four identified zones (Table 2). This could be associated with the location of an industrial estate in ward 2, institutional areas in Ward 3 and the Capital Market in Ward 17. The proportion of Scheduled Castes population (7.27%) in this zone was higher than the one in the central Wards.

Within these sub–areas, Wards 2, 3, 5, 9, 13 and 17 comprise areas that developed during 1960 to 1970, and were added to the initial six planned units. In recent years, this zone has attracted substantial housing in the private sector and institutional development.

(iii) Areas With Low Score (Between 2.83 and 2.99) :

The Wards comprising these sub–areas are mainly located contiguous to wards having higher values, and include Wards 6, 7, 14, 19, 23, 25, 28 and 31 (Fig. 2). Two Wards, numbers 1 and 37, occur as a distinct area in the north of the city. In 1991, this sub–area accounted for the highest proportion of Bhubaneshwar's population (40.54%), registered a low literacy rate as compared to the second sub–area (67.54%) and a low population of workers (31.97%). The sex ratio of 748 females per 1000 males was only marginally lower than the city average of 752 females per 1000 males, but higher than the second sub–area. The levels of female literacy and participation, however, were low (Table 2). In comparison, the proportion of Scheduled Castes population (7.89%) was higher than the two inner zones.

These sub–areas include such important institutions as the Agricultural University and its campus, the .Central Reserve Police Force campus, the Airport Complex and the Coach Repair Factory. Two Wards, numbers 31 and 37 comprise former villages, Dumduma and Patia respectively, which were enumerated for the first time within the urban area in 1991. However, they still retain their rural characteristics. For example, in comparison to this sub–area, these two Wards registered a higher sex ratio (868 females per 1000 males), a higher proportion of workers (34.3%). A lower literacy rate (45.6%) and a higher proportion of Scheduled Castes population (14.16%).

(iv) Areas With Very Low Score (Less than 2.83) :

The main contiguous block of this sub–area includes Wards 32, 33, 34 and 36 and is located on the western periphery of Bhubaneshwar (Fig. 2). Among the other Wards in this category, Wards 21, 29 and 30, are located in the south and Ward 27, is in the southeast and extends along the railway line (Fig. 2). The Wards located in the west and Wards 29 and 30 comprise former villages – Jadupur, Begunia, Aeginia, Ghatikia, Jokalanki and Bharatpur. These were enumerated for the first time as urban in 1991. Most of Bhubaneshwar's future development both institutional and residential, is planned to be located in this belt, and an institutional complex is already being developed in Ghatikia in Ward 33.

In 1991, this sub–area accounted for only 9.45 per cent of Bhubaneshwar's population. In terms of socio–economic characteristics, it registered a low literacy rate (54.33%). A low female literacy rate (43.37%), and a low rate of participation (30.72%). These levels were the lowest among four identified sub–areas and indicate a distance decay function. However, this sub–area registered the highest sex ratio (788 females per 1000 males) among the four zones and the levels of female

participation were the second highest in the city (Table 2). This could be related to the still predominantly rural character of this sub–area. The proportion of Scheduled Caste population living in this zone (14.69%) was the highest in the city and conformed to the well established trend of higher concentrations of this section of society on the peripheries.

The Changing Structure of Bhubaneshwar

In 1971, only the distribution of total and female literates in the city reflected the distance decay function, i.e., a consistent decline with an increase in distance from the central Wards (Table 2). In comparison, the proportion of Scheduled Caste population showed a negative relation and was the highest in the outer Wards. While the former two attributes could be associated with the planned nature of the city and its administrative function, the latter is an established feature of the spatial structure of Indian cities. Further, of the two attributes, namely a comparatively thinly populated core but relatively higher sex ratio values, the former is associated with the planning process which emphsised decongestion of the core, and the latter is a general characteristic of Indian cities. From the second zone outwards, the distribution of population also followed the distance decay pattern, as did the proportion of workers and female workers (Table 2). Although the core and the periphery recorded an almost similar level of participation, the structure of workforce differed, with 'Other Services' and 'Agricultural Labourers' being the main categories of workers in the two zones respectively. The levels of female workers, however, were the lowest on the periphery.

Two decades later, in 1991, the first zone or the core continued to be an area of low concentration of population (Table 2). However, the pattern of distribution of population among the four sub–areas followed a systematic trend, i.e., an increase in

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concentration of population from the central areas outwards, except on the periphery of the city, comprising the recently acquired rural areas. The distribution of proportion of total literates, female literates and total workers conformed to the distance decay function. The pattern of distribution of literates, including female literates was similar to the one noted in 1971. In case of the former, it could be associated with the provision of planned residential development, while in case of the latter, the main association appears to be the rural character of the periphery. The level of sex ratio was high in the central areas, and declined with increasing distance outward, only to register the highest values on the periphery. The rates of female participation also follow a similar trend of higher values in the core, a decline with distance and an increase again on the peripheries.

Conclusions

In 1971, the spatial pattern of sub–areas in Bhubaneshwar city conformed to the core periphery pattern, i.e., a central core with a high composite score and a periphery with comparatively lower values. Two decades later, in 1991, the spatial pattern remained broadly the same and, in fact, was accentuated.

However, despite the apparent similarity of the spatial pattern of residential sub–areas in Bhubaneshwar, there have been distinct changes in the trends of socio–economic attributes over time and space. The proportion of total literates, female literates and Scheduled Castes population are the only variables that have maintained a consistent trend, namely, a decline with distance from the central areas in the case of the former two attributes, associated with the administrative function, and an increase with distance in case of the latter attribute, a well established characteristic of Indian cities. Further, the core, comprising the planned areas of the city remains an area of low concentration of population, in conformity with the plan proposal of decongesting the

city center. In 1971, sex ratio increased marginally outwards, from the central areas only to register a decline on the periphery, where it was the lowest. By 1991, an improvement in infrastructure resulted in comparatively higher sex ratios in the central parts of the city. However, the highest sex ratios in 1991 were recorded in the periphery, associated with its essentially rural character. The Distribution of workers in 1971 also showed a trend of slight increase with distance from the core, but a decline on the periphery. By 1991, this trend had changed considerably, and conformed to the distance-decay pattern.

More fundamental, however, have been the changes in the associations between the three selected variables. Firstly, they still do not have a positive association as would have been expected. Secondly, the changes in associations between 1971 and 1991 reflect changes in the demographic character of Bhubaneshwar, and the relative importance of socio–economic variables in determining the character of sub–areas. For example, in the initial years, literacy emerged as a differentiating factor; later, with the development of the city and the availability of a conducive residential environment, sex ratio becomes more important.

Finally, the role of the plan framework and proposals is particularly strong in the initially planned central parts of the city, which recorded a high composite score. The impact of the plan framework becomes less pervasive with distance from the core, and traditional socio–economic processes emerge as strong determinates on the periphery of the city. This is in keeping with the currently unplanned and essentially rural character of Bhubaneshwar's peripheral areas.

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The index was computed by the following formula:

$$It = \Sigma\, St\, /\, N,$$

Where , St = the standardized score for tract t

N = the number of variables

It = the index for tract t

See: Johnston, R.J. (1978) : Residential Area Characteristics: Research Methods for Identifying Urban Sub-Areas-Social Area Analysis and Factorial Ecology, in D.T. Herbert and R.J. Johnston (Eds) *Social Areas in Cities: Processes, Patterns and Problems*, John Wiley, Chichester, p. 181.

Concentration index was calculated using the following formula:

$$C.I. = \frac{\dfrac{\text{Total value of Attribute 1 in Ward A}}{\text{Total Population of Ward A}}}{\dfrac{\text{Total Value of Attribute 1 in City}}{\text{Total Population Of city}}}$$

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