ISSN 0971-4170

Ind. J. of Landscape Systems and Ecological Studies **44** (1) June - 2021, 155-168

Demographic Structure, Work Participation and Association with Social Sustainability in Nadia District, West Bengal, India

Iman Sk*

Abstract : *Demography of an area means the study of changes in number of birth, marriages, death, migration, growth of population etc. in a particular area during a period of time. The present paper is an attempt to analyze the demographic structure, work participation and association with social sustainability in Nadia District, West Bengal, India; and to analyze the pattern of existing population growth rate, birth rate, death rate and infant mortality rate and literacy rate. Based on the C.D. Block wise secondary data obtained from the District Census Handbook, Nadia; and Primary Health Report, West Bengal, choropleth maps have been preparedfor the area by taking the values of population growth rate, birth rate, infant mortality rate, work participation rate and literacy rate; and also to measure the correlation among birth rate, work participation rate and infant mortality rate with literacy rate. The result shows that the highest population growth rate (13.51%) in 2001-2011 census period occurred in Krishnnagar sub- division. Based on 2011 census data correlation measurement negative correlation have occurred in birth rate with literacy (-0.338) and infant mortality rate with literacy (-0.718) and positive correlation have occurred in work participation rate with literacy (0.449). However, balanced conditions among population growth rate, birth rate, death rate mainly infant mortality rate, and literacy rate, and job facilities are suggested for considering demographic change of the region.*

Keywords : *Infant Mortality Rate, Mean Centre of Population, Literacy and Work Participation Rate.*

Introduction

A number of diverse stages are experienced in demographic growth through which population passes, the stages being jointly known as the population cycle or the theory of demographic transition. It is the relationship between fertility and mortality. Demographic transition is a general model describing the evolution of levels of fertility and mortality over time. It has been devised with particular reference to the experience of developed countries. The theory of demographic transition was put forth by scholars like W.S. Thompson (1929), Notestein (1945) and Blacker (1947)

* *Assistant Teacher in Geography, Chakdignagar Tarakdas Memorial High School, Kalirhat, Krishnanagar, Nadia, E-mail : imansk87@gmail.com*

observing the fertility and mortality of Europe, America and Australia. The most vital factor of demographic transition is growth of population.

While participation in the labour market is not by itself a sufficient condition to ensure an increase in the bargaining power of population and a substantial decision-making role for men within families, ample evidence in the literature (Bennet and Robinson, 2000) shows that the ability to earn an income by active participation in the labour market is a vital prerequisite for the economic independence. A good deal of information of a historical demographic nature is available from empirical Gazetteer of Nadia by West Bengal District Gazetteers, Department of Higher Education, Govt. of West Bengal - mainly those volumes published prior to 1921 - as well as from the reports of the Census of India since 1881. The social and anthropological studies by Moreland (1920) and more recently a study on agricultural colonisation in India by Farmer (1974) also provide valuable background on the determinants of population redistribution in some parts of south Asia. A cartographic presentation of a wealth of data can be found in a monumental historical atlas of South Asia especially of India (Schwartzberg 1978). Zachariah's study on migration in India provides a useful lead to the nature of population shift in this country (Zachariah 1963). More recently, Jain (1975), Pareek and Rao (1981) reviewed the trends and the outcome of current research on population, including population distribution, migration and development perspectives in India. In fact West Bengal is well ahead of all Indian states in research on population movement and recent studies are quite numerous (Zachariah 1964, Chandrasekhar 2006, Rudra and Chattopadhyay 2016, and Halder 2018). The study of demography is immense importance to literacy, economy and society. This study tries to understand how far the literacy rate and growth rate of the economy is keeping pace with the growth rate of population. For a developing region like Nadia district rapid population growth reduces per capita income, lowers the standard of living, plunges the economy into mass unemployment and under employment, brings environmental damage and puts a burden on existing social infrastructure. The studies highlight such problems which are the concomitant result of population growth, so that proper planning can be made by state and non-government social organizations for micro level implementation to get a desired macro level change.

Objectives of the Study

- To understand the intra-district level population growth rate of Nadia district.
- To analyze the shift of mean centre of the study district.
- To study the correlation between literacy rate and birth rate, literacy rate and work participation rate and also literacy rate and infant mortality rate of study area.
- To suggest some remedial to improve the socio-economic conditions of study district.

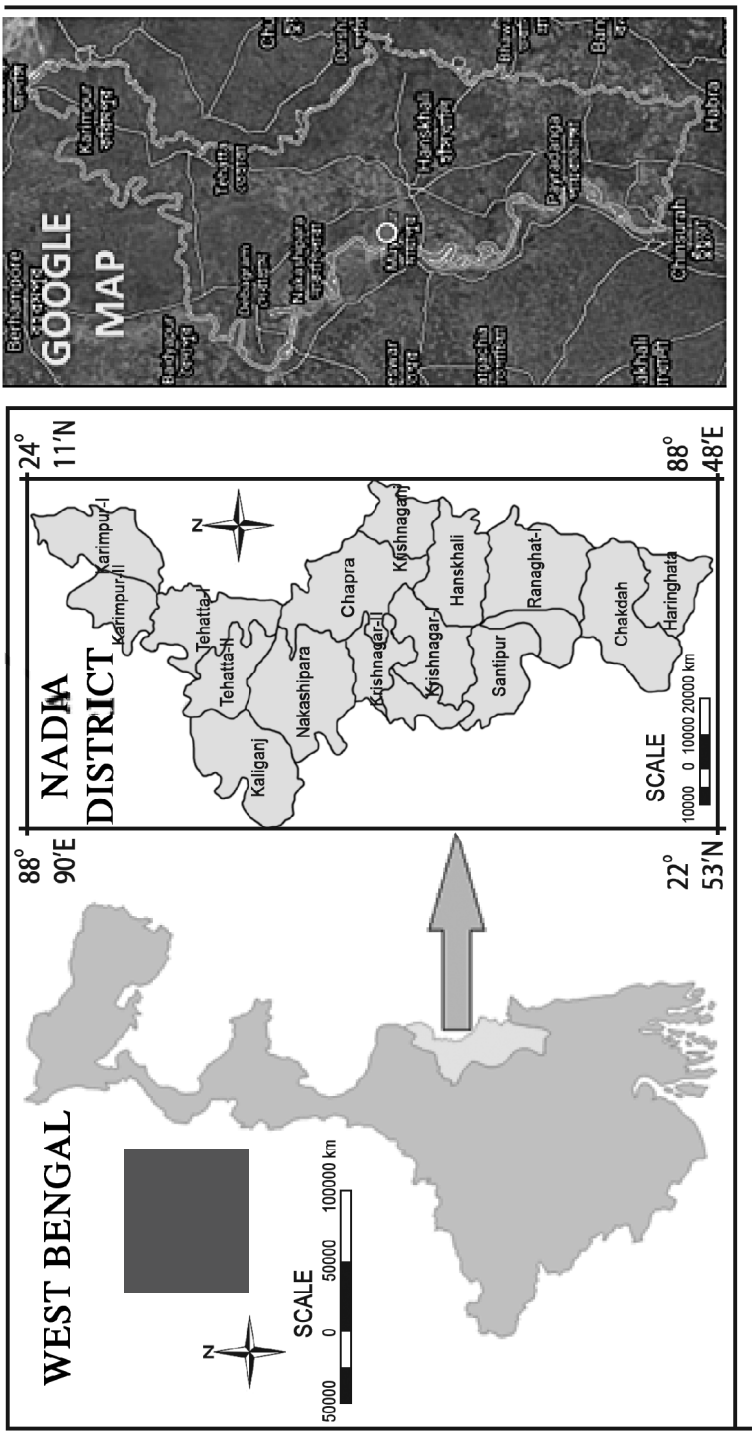

Fig. 1. Location of Study Area: left Nadia District in West Bengal map, middle Nadia District map, right Google map of Nadia District.

The Study Area

Nadia district is situated between 22^0 53´ N and 24^0 11´ N latitude and 88^0 09´ E and 88^0 48´ E longitude. This district is linear in shape with north-south orientation. The district is approximately 14 metres above the mean sea level. The Tropic of Cancer divides the district in two parts. The geographical boundary of Nadia district comprises of Bangladesh in east, Bardhaman and Hooghly district in west, Murshidabad district in north and north west and North 24 Parganas towards south and south east. The district has 17 Blocks and covered an area about 3927 sq. km. or 1,516 sq. km.

Material and Methods

The study is based on the secondary data obtained from Government of India, Report of Census, District Census Handbook and Primary Health Report. The C.D. Blocks is taken as a unit of study, for analysis and mapping purpose. Data thus collected, interpreted and represented cartographically by using mean centre and choropleth technique. To calculate the mean centres of study area, an arbitrary co-ordinate system has been superimposed on the map of Nadia district, with its origin at the bottom left-hand corner. For simplicity the horizontal axis measuring easting's has been labeled X, and the vertical axis measuring northing's has been labeled Y. This convention for labeling co-ordinate axis will be followed throughout the study. Thus, rows for Y-axis and columns for X-axis are utilized for measurement.

The mean centre can now be found simply by calculating the mean of the X co-ordinates and the mean of the Y co-ordinates. These two mean co-ordinates mark the location of the mean centre. The equation for the mean centre is following:

$$MX = \frac{\sum PX}{\sum P} \text{ and } MY = \frac{\sum PY}{\sum P}$$

Where MX and MY are the mean centre of X and Y co-ordinates, P represent the population of distinct Blocks in definite year, ΣP is the total population of district in definite year, X and Y are the measurement values of X and Y axis (Burt and Barber 1996).

Here, represents the choropleth map of the study area in Block wise for analysis of the pattern of literacy rate, birth rate, and work participation rate, infant mortality rate of Nadia district and also Spearman's Rank Difference method is used for analyzing the correlation between literacy and birth rate, literacy rate and work participation rate, literacy rate and infant mortality rate.

The main data source of this study is Government of India, Report of Census 2011, District Census Handbook, Nadia; 2011, Primary Health Report, West Bengal-2015, various books, articles etc. The data taken from Report of Census, District Census Handbook, and Primary Health Report used MS Excel: 2007, IBM SPSS

Statistics Version 23 to test the signification level between the associations of variables and used Quantum Geographical Information System (Version: 2.14.21) Software for analysis the cartographical representation the Block wise pattern of literacy rate, birth rate, work participation rate, infant mortality rate in Nadia district.

Results and Discussion

Intra-District Level Population Growth Rate of Nadia District

The "population growth rate" is refers to the rate at which the number of individuals in a population increases in a given time period. Table 1 explains the intra-district level population growth rate of Nadia district during 1991-2001 and 2001-2011. In Nadia district population growth rate is observed 19.54 per cent in 1991-2001, which comes down 12.22 per cent in 2001- 2011. It clearly reveals that population growth rate in Nadia district is declined by the awareness of education.

Table-1. Population Growth Rate (PGR), Nadia district (in Percent)

Sub- division	PGR (1991-2001) in percentage	PGR (2001-2011) in percentage
Tehatta	16.87	12.10
Krishnnagar Sadar	20.93	13.51
Ranaghat	13.01	11.73
Kalyani	18.64	11.53
Nadia District	19.54	12.22

Source: Calculated by the author from Government of India, Report of Census 2011

In 1991- 2001 census periods, highest population growth rate is found in Krishnnagar Sadar sub-division (20.93%) and lowest population growth rate is found in Ranaghat sub-division (13.01%) (Fig.2). Similarly in 2001 – 2011 census periods, population growth rate is higher in Krishnnagar Sadar sub-division with 13.51% growth rate and lowest population growth rate is found in Kalyani sub-division (11.53%) (Fig.2). Perhaps at intra-district level the educational facilities, an urban amenity, better opportunities for job attracts male migrants and the inflow from Bangladesh across the international boundary has contributed much to the population growth of Nadia district.

Mean Centre of Population

The mean center or centroid is the point on which a rigid, weightless map would balance perfectly, if the population members are represented as points of equal mass. Mathematically, the centroid is the point to which the population has the smallest possible sum of squared distances. It is easily found by taking the

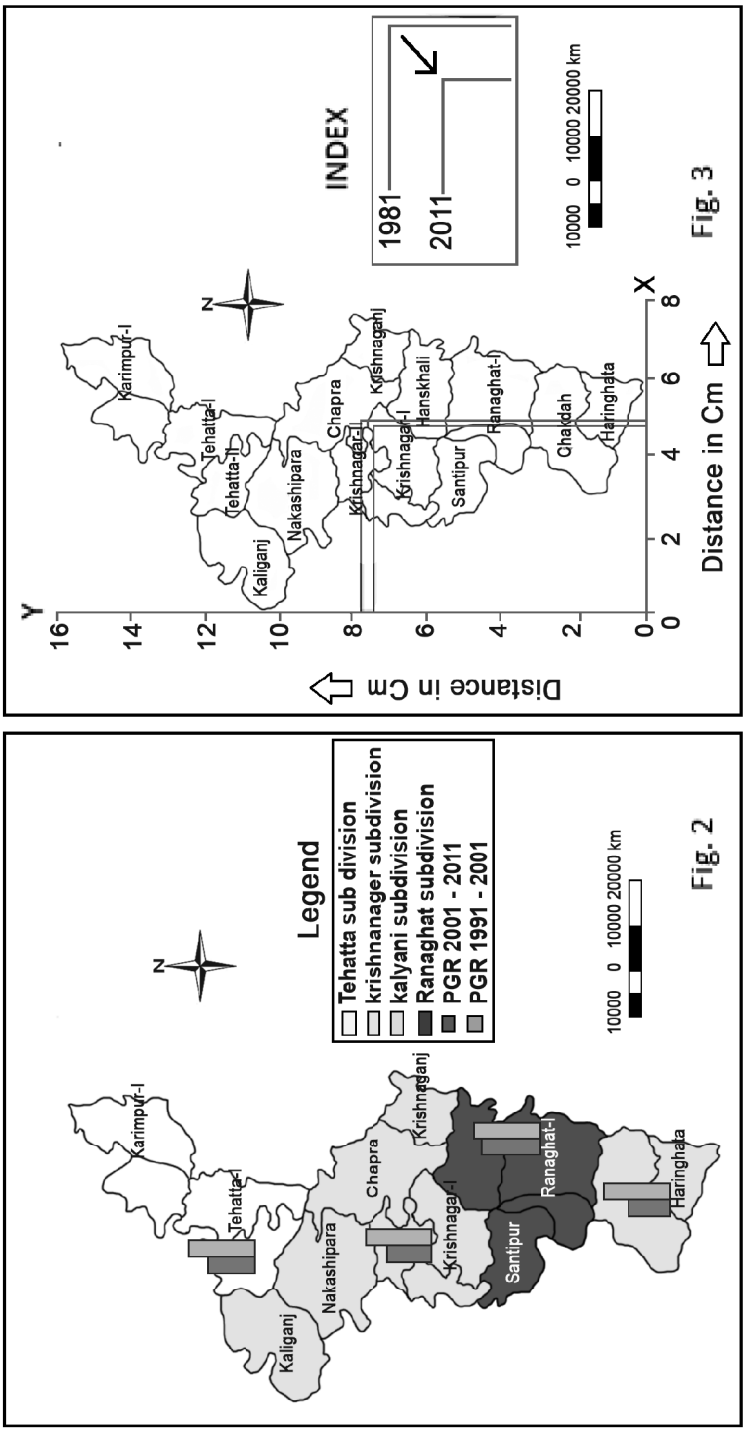

Fig. 2- Showing Sub Division Wise Population Growth Rate of Nadia District, 1991- 2001 and 2001- 2011

Fig. 3- Showing Mean Centre of Population and It's Shifting (1981- 2011).

arithmetic mean of each coordinate. If defined in the three-dimensional space, the centroid of points on the Earth's surface is actually inside the Earth.

In 1981 location of mean center of Nadia district was at 4.87 cm. and 7.77 cm. as X and Y coordinate in the south- west corner of Chapra Block, but in 2011 it is found at 4.76 cm. and 7.50 cm. as X and Y coordinate in the north- east corner of Krishnnagar-I Block. In 30 years (1981 to 2011) the mean centres of Nadia district shift from north-east to south-west direction (fig.3).

Correlation between Literacy and Birth Rate

Literacy and education is universally recognized as a major component of human development. As such certain minimum level of literacy seems to be essential

Table 2- Correlation between Literacy and Birth Rate, 2011

Block Name	Literacy Rate	Rank	Birth Rate	Rank	d	d^2
Karimpur I	67.70	14	18.4	1	13	169
Karimpur II	62.04	17	17.9	2	15	225
Tehatta I	70.72	9	17.5	3.5	5.5	30.25
Tehatta II	68.52	10.5	17.2	5.5	5	25
Kaliganj	66.11	15	16.8	8	7	49
Nakashipara	64.86	16	16.3	9	7	49
Chapra	68.28	12	16.1	11.5	0.5	0.25
Krishnnagar-II	68.52	10.5	16	13.5	-3	9
Nabadwip	67.72	13	15.6	15	-2	4
Krishnnagar-I	71.45	8	15.5	16	-8	64
Krishnaganj	72.86	7	17.2	5.5	1.5	2.25
Hasnkhali	80.11	2	16.9	7	-5	25
Shantipur	73.10	6	17.5	3.5	2.5	6.25
Ranaghat-I	77.55	5	16.1	11.5	-6.5	42.25
Ranaghat-II	79.27	4	16.2	10	-6	36
Chakdah	80.03	3	15.2	17	-14	196
Haringhata	82.15	1	16	13.5	-12.5	156.25
Nadia District	74.97	12.23				

Source: Calculated by the author from District Census Handbook, Nadia; 2011 and Primary Health Report, West Bengal- 2015

for a population to break out the vicious of poverty. Literacy affected on various attributes of the population such as birth rate, death rate, migration and also population growth rate. The birth rate is the total number of live births per 1,000 in a population in a year or period. Thus, the analysis of literacy and birth rate is immensly significant. According to 2011 census the literacy rate and birth rate of Nadia district are 74.97% and 12.23%.

The Spearman's Rank difference method is used for the calculation of the correlation of literacy and birth rate in Nadia district. It is observed that there is rather low and negative correlation i.e. r = -0.338 between the literacy and birth rate in Nadia district.

There are wide inequalities in the literacy and birth rate of Nadia district in 2011. The highest literacy is found in Haringhata Block and lowest in Karimpur II Block. The highest birth rate is found in Karimpur I Blockwhereas lowest in Chakdah Block of Nadia district. But the correlation between literacy and birth rate found in low degree and negative angle i.e. r = -0.338 at 0.092 significance level (single tailed). It means high literacy rate, low birth rate. It is observed higher the literacy rate lower the birth rate i.e. Haringhata Block and lower the literacy higher the birth rate i.e. Karimpur II Block of Nadia district.

Correlation between Literacy and Work Participation Rate

The total number of persons employed or employable in a country known as work participation rate. Thus, the analysis of literacy and work participation rate is immense significant. According to 2011 census, literacy rate and work participation rate of Nadia district are 74.97% and 34.23%.

The Spearman's Rank Difference method is used for the calculation of the correlation of literacy and work participation rate in Nadia district. It is observed that there is rather weak and positive correlation i.e. r= 0.449 between the literacy and work participation in Nadia district.

There are found disparities in the literacy and work participation rate of Nadia district in 2011. The highest literacy is found in Haringhata block and lowest in Karimpur II block. The highest work participation rate is found in Shantipur block where as lowest in Tehatta II block of Nadia district. But the correlation between literacy and work participation rate found in weak degree and positive angle i.e. r= 0.449 at 0.035 significance level (single tailed). It means high literacy rate, high work participation rate. It is observed higher the literacy rate higher the work participation rate i.e. Nabadwip, Shantipur block and lower the literacy lower the work participation rate i.e. Tehatta-I, Tehatta –II, Karimpur-II, Nakashipara, Kaliganj and Chapra block of Nadia district.

Table-3. Correlation between Literacy and Work Participation rate, 2011

Block Name	Literacy Rate	Rank	Work participation rate	Rank	d	d^2
Karimpur I	67.70	14	34.74	11	3	9
Karimpur II	62.04	17	33.63	12	5	25
Tehatta I	70.72	9	33.51	13	-4	16
Tehatta II	68.52	10.5	30.84	17	-6.5	42.25
Kaliganj	66.11	15	31.03	16	-1	1
Nakashipara	64.86	16	32.53	14	2	4
Chapra	68.28	12	31.73	15	-3	9
Krishnnagar-II	68.52	10.5	37.73	3	7.5	56.25
Nabadwip	67.72	13	39.25	2	11	121
Krishnnagar-I	71.45	8	37.65	4	4	16
Krishnaganj	72.86	7	35.86	7	0	0
Hasnkhali	80.11	2	35.69	8	-6	36
Shantipur	73.10	6	41.54	1	5	25
Ranaghat-I	77.55	5	36.53	6	-1	1
Ranaghat-II	79.27	4	34.89	10	-6	36
Chakdah	80.03	3	35.65	9	-6	36
Haringhata	82.15	1	37.23	5	-4	16
Nadia District	74.97	34.23				

Source: Calculated by the author from District Census Handbook, Nadia; 2011

Correlation Between Literacy and Infant Mortality Rate

Infant mortality is the death of young children under the age of one year. This death toll is measured by the infant mortality rate (IMR), which is the number of deaths of children less than one year of age per 1000 live births. Thus, the analysis of literacy and infant mortality rate rate is immense significant. According to 2011 census the literacy rate and infant mortality rate of Nadia district are 74.97 per cent and 30 per cent.

The Spearman's Rank Difference method is used for the calculation of the correlation of literacy and infant mortality rate in Nadia district. It is observed that there is rather moderate and negative correlation i.e. r = -0.718 between the literacy and work participation in Nadia district.

Table-4. Correlation between Literacy and Infant Mortality Rate, 2011

Block Name	Literacy Rate	Rank	Infant Mortality Rate	Rank	D	d^2
Karimpur I	67.70	14	38	1	13	169
Karimpur II	62.04	17	37	2	15	225
Tehatta I	70.72	9	35	3	6	36
Tehatta II	68.52	10.5	33	4	6.5	42.25
Kaliganj	66.11	15	31	7.5	7.5	56.25
Nakashipara	64.86	16	32	5.5	10.5	110.25
Chapra	68.28	12	32	5.5	6.5	42.25
Krishnnagar-II	68.52	10.5	31	7.5	3	9
Nabadwip	67.72	13	28	9.5	3.5	12.25
Krishnnagar-I	71.45	8	26	12	-4	16
Krishnaganj	72.86	7	24	16	-9	81
Hasnkhali	80.11	2	25	13.5	-11.5	132.25
Shantipur	73.10	6	24	16	-10	100
Ranaghat-I	77.55	5	27	11	-6	36
Ranaghat-II	79.27	4	24	16	-12	144
Chakdah	80.03	3	25	13.5	-10.5	110.25
Haringhata	82.15	1	28	9.5	-8.5	72.25
Nadia district	74.97	30				

Source: Calculated by the author from District Census Handbook, Nadia; 2011 and Primary Health Report, West Bengal- 2015

There are wide imbalance in the literacy and infant mortality rate of Nadia district in 2011. The highest literacy is found in Haringhata block and lowest in Karimpur II block. The highest infant mortality rate is found in Karimpur I block where as lowest in Krishnaganj, Shantipur and Ranaghat-II block of Nadia district. But the correlation between literacy and infant mortality rate found in moderate degree and negative angle i.e. r = -0.718 at 0.001 significance level (single tailed). It means high literacy rate, low infant mortality rate. It is observed higher the literacy rate lower the infant mortality rate i.e. Krishnaganj, Shantipur and Ranaghat-I, Ranaghat-II, Krishnnagar-I and Chakdah block and lower the literacy higher the infant

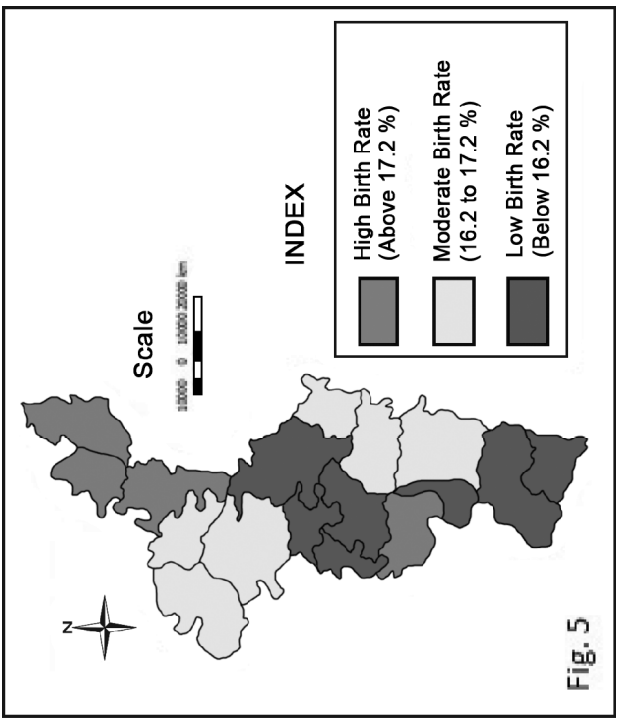

Fig. 5- Showing Pattern of Birth Rate of Nadia District in 2011

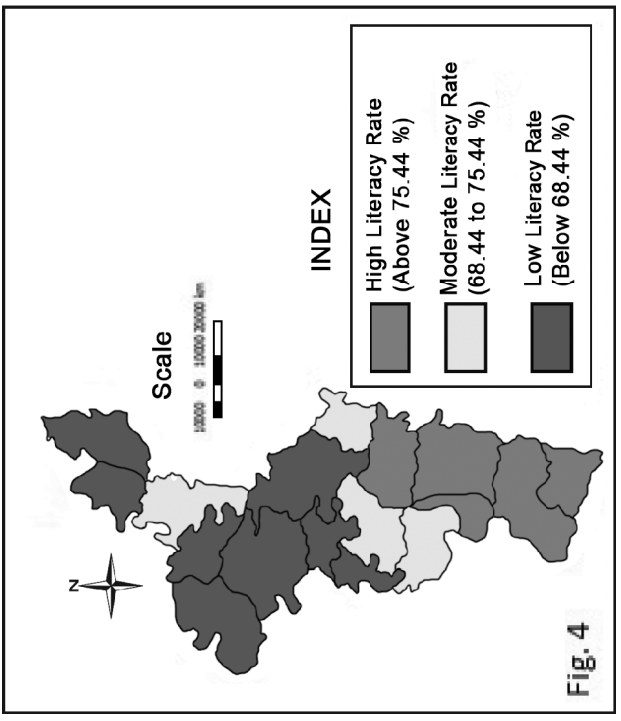

Fig. 4- Showing Pattern of Literacy Rate of Nadia District in 2011

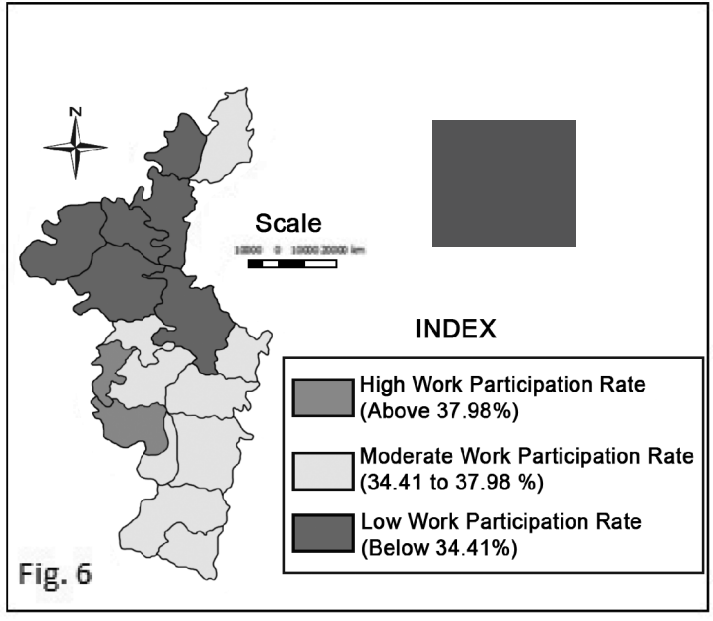

Fig. 6- Showing Pattern of Work Participation Rate of Nadia district in 2011

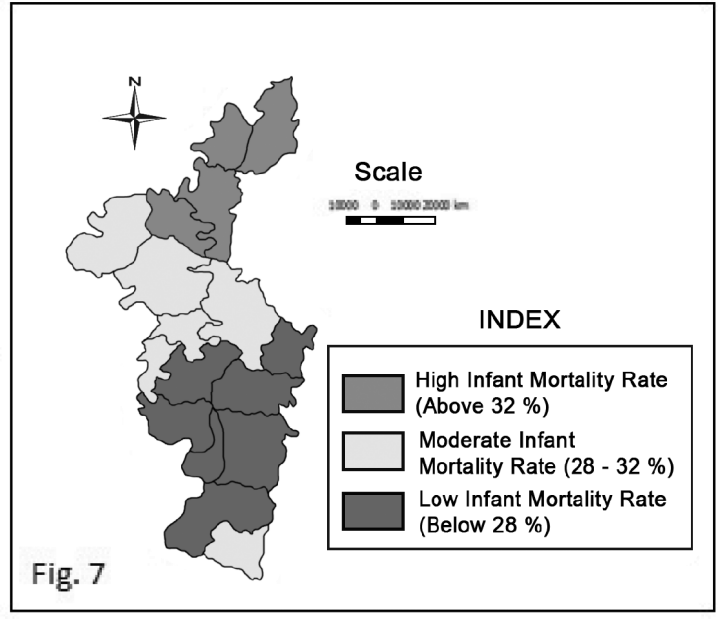

Fig. 7- Showing Pattern of Infant Mortality Rate of Nadia District in 2011

mortality rate i.e. Karimpur-I, Karimpur-II, Tehatta-I and Tehatta-II block of Nadia district.

Conclusion

This paper searches the process of demographic structure, work participation and association with social sustainability in Nadia district. With the change of demographic structure of a population, the socio-economic performance will change. As an example if literacy rate increase, birth rate, death rate will decline which indicate the population growth rate decrease and on the contrary the working population will increase. After this, the status of economic condition of that population is going to increase. Here another factor influences the economic condition, lower the infant mortality rate higher the savings. As capital investment is very cheap among least count of infant mortality rate, thus increase the physical capital accumulation and growth. Comparing the young and older people the potentiality of economic outcome is higher among working age population, reason behind this dependent population behaves only as a consumer and the labor population is the producer. It is observed that the demographic structure is not uniform throughout the given time period because of fluctuation of birth and death rate. It is also observed that the district level demographic structureis very much dissimilar. Comparing with demographic status of India and West Bengal, Nadia district has maintaining better condition. But considering demographic characteristics in this district is far behind from other district of West Bengal state.

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