# SPATIAL PATTERN OF POPULATION GROWTH AND HUMAN DEVELOPMENT :– AN ENQUIRY IN BANKURA DISTRICT OF WEST BENGAL

*Thesis submitted for the degree of*
*Doctor of Philosophy in Geography*
*Vidyasagar University*

*Submitted by*

## Suchandra Paul

Research Scholar

## DECEMBER, 2016

**Department of Geography and Environment Management**
**Vidyasagar University,**
Midnapore, West Bengal

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    *She has fulfilled required rules and regulations prescribed by the university relating to nature and tenure of research, Seminar talk and publication etc.*

    *It is also certified that this research is original in all respect and no one in India and abroad has published the matter of this research before.*

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## *CERTIFICATE*

This is to certify that the research work embodied in this thesis entitled *"Spatial Pattern of Population Growth and Human Development :-An Enquiry in the Bankura District of West Bengal"* has been carried out by Suchandra Paul, registered Ph.D. scholar of Vidyasagar University (Regn.No.425/Ph.D.(Arts/Com./Sc.),Dated 22.02.2014) under my supervision. The outlook of enquiry and nature of outcomes incorporated in this thesis have not been submitted for any other degree elsewhere. It is further to note that Mrs. Paul has followed all the rules and regulations laid down by the University for carrying out this research work.

I am sure that her work will attract attention of experts in this field and also get due appreciations an original contribution in relevant area in Indian context.

I wish success in every walk of her life.

Dr. Sanat Kr. Guchhait

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# DECLARATION

I do hereby, declare that I have completed this thesis entitled "**Spatial Pattern of Population Growth and Human Development :- An Enquiry in the Bankura District of West Bengal**" with my utmost sincere efforts under the joint supervision of Dr. Nilanjana Das Chatterjee, Associate Professor, Department of Geography and Environmental Management, Vidyasagar University and Dr. Sanat Kr. Guchhait, Professor, Department of Geography, The University of Burdwan. The outlook of enquiry and nature of outcomes incorporated in the thesis have not been submitted anywhere in the tune of this enquiry of the said area. I have followed all the rules and regulations laid down by the University for carrying out this research work.


Date:                                        Signature of the Scholar

Place:

# *Preface*

S tudy of population is not only diverse in nature but also a vast enquiry. The vast content and methodology of different disciplines studying population notwithstanding, each social science has made valuable contributions towards understanding of spatio-temporal pattern of population (Wood, 1971, pp-1). It is also true for research in population Geography, as the study of population and its related issues over space is popularly designed as population Geography. The study of population distribution has been the focus of traditional human geography since long. The place of man in geography has been not only a matter of academic dispute but also a widely-diversified research field, where newer and newer dimensions are emerging with the consequent issues of man-environment interaction.

This enquiry as a research investigation of a under developed district of West Bengal in relation to population perspective is neither a purely traditional nor a recent issue related to population. Rather it seeks to employ demography of population growth and its rational to human development. Population growth and human development is always a catchy issue since 1990. It's significance in not only exerted at the global, national or state level; it is becoming more relevant at the district or block level as human development is intricately inter related with population growth of a region.

After independence while most of the district of West Bengalwas affected by huge influx of migration, the district Bankura, Puruliya and Birbhum were far ahead of this. Even today, the growth of population of Bankura District is not so alarming. But considering resource, population and human development, District Bankura and Puruliya are depicting a gloomy picture. Due to this low response district level or block level population dynamics of Bankura as a geographical enquiry is least proffered, though poverty, human development, livelihood, forest potentials, tribal concentration, forest-tribe association of Bankura district or its blocks have been investigated by several researchers.

Keeping this primary outlook in mind, the whole design of enquiry have been broadly articulated into four sections, viz. Decadal growth perspective of population size and density, growth relatives of the blocks, spatio-temporal growth perspective of composition of population and human development.

Section-1 Outlines the simple growth perspective of the district as well as the blocks in terms of index of growth and decadal growth dynamics of the blocks in terms of size and density. In unfolding population size and density of decadal growth, the rate of change of growth and threshold has been taken into consideration, where theoretically threshold of population size and density normally inversely correlated with rate of change of growth. If it is not the scenario, logically it, considers with either low growth or rapid growth. Different blocks are judged under these three circumstances.

Section - 2 scrutinized the growth relatives of the blocks in terms of system component growth perspectives, area-population relationship, and variability of growth of population. System component growth relatives exerts relatively higher, moderate and lower rate of growth in respect to system, while area-population relationship identifies the level of population pressure over the blocks. On the other hand, variability of growth of each block is measures by coefficient of variation.

Section - 3 elaborates more detail of spatio-temporal growth of population in relation to population composition in the form of caste composition, growth rate, sex composition. Mainly caste composition and sex composition have wider variability while literacy, rural urban population and occupational composition are more or less uniform over time in terms of percentage share and therefore carefully avoided.

Section - 4 attempts to correlate population growth with human development. It is true that study of population growth without correlation of poverty, health, income and resource is meaningless. Therefore, population growth with livelihood or population growth with human development is assertion in the study of geography, economics and sociology. Here the attempt has been made to correlate population growth with human development and a systematic analysis is thus ends up to portray the demographic mosaic of the district.


*Date:*
*Place:*                                            *Signature of the Scholar*

# *Acknowledgements*

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# List of Abbreviations

| | |
|---|---|
| $\overline{X}$ | Mean value |
| Sd. | Standard Deviation |
| z-score | Standard score $= \left( \dfrac{X_i - \overline{X}}{S.D} \right)$ |
| c.v. | Co-efficient score $= \left( \dfrac{S.D}{\overline{X}} \right) \times 100$ |
| $PCA_1$ | First principal component value |
| $PCA_2$ | Second principal component value |
| $PCA_3$ | Third principal component value |
| PRINSCORE | Principal component score of the variable or district on the basis of first principal component value |
| R-Mode Analysis or R-Technique | Principal component analysis of time related variables |
| Q-Mode Analysis or Q-Technique | Principal component analysis of the transpose of the data matrix of time related variables |
| O-Mode Analysis or O-Technique | Principal component analysis of spatio-temporal data matrix |
| P-Mode Analysis or P-Technique | Principal component analysis of the transpose of the spatio-temporal data matrix |

# Chapter – 1 : Prelude to the Study

- Introduction

- Conceptual Framework

- Statement of the Problem

- Key Terminologies

- Approach to study

- Location of the Area under Study

- Reasons for the Selection of the Study Area

- Objectives of the Study

- Research Questions

- Hypothesis Built up

- An Outlook to Enquiry

- Limitations

# Prelude to the Study

## 1.1 Introduction

Population Geography has changed its outlook from time to time with the new approaches of population study but never can it ignore the spatio-temporal perspective of population change like growth, birth rate, death rate, migration, mortality, fertility, health, education, human development etc.

In the 1991census, West Bengal for the first time came to earn the dubious distinction of becoming the most densely populated (767 persons/sq.km) state in India, the second most populated country of the world. It continued its position in 2001, though in 2011 census, Bihar has become ranked first among all the states (1106 persons/ sq. km). It is true that concentration of population in West Bengal has increased tremendously after the partition of India. The refugee influx from 1947 onwards along the bordered districts coupled with internal migration from the neighboring states like Bihar, Utter Pradesh and Orissa has added huge population in almost all the districts expect Birbhum, Bankura and Purulia. Of these relatively three low growth districts in respect of population, Bankura is the only exception which has no connection either with the international border or the state border. For this reason, growth of population of Bankura is basically an internal growth. At the same time, the district has a low concentration of urban population. Of the total population, most of the people belong to rural segment. More than 90% of the rural population reflects the identity of the district with a rural one. Rural population is less migratory in nature and therefore changing pattern of spatial population is less dynamic, but a specific pattern of population can be observed in relation to physiographic dynamics. At the same time, urban population at least two patches have significantly altered the spatial pattern of population.

In terms of Human Development, the district is occupying 11th position according to 2004 estimates. This position is not a better one rather depressive in comparison to other districts. This low rank of human development index is due to its physiographic barrier, limitation of soil productivity, absence of large size industries as well as significant amount of rural population. In respect of human development,

Western and North-Western blocks are showing poor performance basically due to their physiographic constraints. Northern blocks presently are experiencing satisfactory HDI index due to mining and industrial development. On the other hand, Eastern and South-Eastern portion are showing better results because of its agricultural prosperity. The whole analysis of this enquiry thus has been cropped up in terms of spatial pattern of population growth from 1951 onwards and human development for the last one decade also.

This research work is an investigation to glean out the demographic dynamics over space and time and also attempts to analyze spatio-temporal demography with human development of Bankura district

## 1.2 Conceptual Framework

The census of 2011 has enumerated total population of 35,96,674 with a density of 523 persons / sq. kms in respect of absolute figure. The district ranks 13 in the size of population, while in terms of density, the rank is $18^{th}$ in comparison to other district. Bankura is not a densely-populated district, but its uniqueness relates to differential concentration of population and thereby human development over the space. For this reason, spatial pattern of population growth and human development has been taken into the major thrust area of the research. Against this scenario, the proposed investigation aims to address spatial pattern of population growth after independence as well as human development over the last six decades. Population growth and human development are intricately interrelated as number of population has to adjust with the fixed natural resource base in a rural society and is ultimately reflected in the quality of life. So, it has been planned to set out a critical examination of growth of population volumes and density since 1951. The basic purpose is to focus on the spatiality of growth by recourse to the quantitative analysis.

The other aspect of this enquiry focuses on the inter-blocked variation of the population size and density over two time periods. First period covers the decadal growth rate between1951 to 1981 while the second one stems from 1981 to 2011. To crop up the inter-blocked disparity of growth system component analysis is taken into deep investigation. In order to achieve this perspective, allometric growth is taken into consideration.

Any analysis of population cannot be undertaken without human and social development. So, to make a comprehensive relationship between population growth and human development different factors have been taken into considerations which are reflected through factor analysis to perceive the role of parameters for the human as well as socio-economic development.

The whole thesis therefore attempts to examine different aspects of population growth and its reflection in spatial unit added with a comprehensive analysis of human development-its correlates and attributes. Thus, a synthesis is made between population dynamics and human development of the district of Bankura.

District Bankura for its central location in *Rarh Bengal* (L.S.S O Malley, 1908) associated with significant forest coverage and waste land apparently depicts less diversity in the growth perspective of demography. Apart from the small south-eastern tract of alluvial plain, rest of the area is covered by lateritic soil or rocky out crop with or without forest cover. Such a physical landscape is not conducive for agricultural prosperity and thereby no significant prospect of urbanization.

Thereby, present investigation deeply involves spatio-temporal change of different facets of population especially rural population and its different dimensions indicating it nature of human development.

## 1.3 Statement of the Problem

Though the oldest settlement of Bengal is marked in Bankura district, the growth of population of the district and most of its blocks have never experienced high growth or growth rate as compared to the most of the districts and their blocks. Poor agrarian perspective, low urban function, has never attracted the people from outside. But the spatio-temporal demography has been influenced by epidemic, Raj dynasty, and variable proportion of backward cast people.

Recent stupendous growth of mining and industry has created differential mosaic of demography, especially in the north which is the point of investigation. The temporal frame is confined within 1951-2011, with the basic reflection of census data whereas spatial mosaic is basically a block level study.

Such an apparently silent demography raises its voice in relation to physical barrier, social inertia and recently rejuvenated urban industrial function and seeks to understand the reasons behind the socio-spatial mosaic and its rational tuning with human development.

## 1.4 Key Terminologies

In articulating the ideas and explaining the population growth relative of the district of Bankura from 1951 -2011, some terminologies have been used which need to be defined and conceptualizing at the initial stage of enquiry. These are nature of population growth, spatial pattern of population growth, spatial pattern of human development, system component growth perspective, spatial packing and demographic relief.

**Nature of population growth**

From the very beginning human civilization has experienced growth over time and space, especially huge growth after industrial revolution. Therefore population growth has become the focus of enquiry to the Geographers, Demographers, and Sociologist etc. Geographers not only look on the size and density of population ,its nature of growth is taken into consideration with physical factors, socio-economic factors, structure of population, composition of population etc. Here size, density and composition are widely discussed.

**Spatial pattern of population**

Spatial pattern of population is the basic notion of enquiry to a Geographer (Clark, J.I., 1981). Therefore it is attempted to explore spatial growth of size and density, spatial pattern of composition of different types-like health, literacy, caste, religion etc.

**Human development**

Human development has become the integral part of the population Geography. It accentuates to unfold pattern of human development through different indices like human development index, gender gap index, and poverty index. Here socio- economic development and human development are taken into consideration.

**System component growth perspective**

Population growth, human welfare, income, literacy, health facility are essentially condition by administrative as well as population policy and development. Therefore, in demographic analysis, growth relatives of sub system are studied with respect to system for effective planning and development. This idea is popularly known as system component growth perspective.

**Spatial packing**

Spatial packing (Coffey, J., 1981) of population is an important geographical idea to study compactness or diffusion of population over space. Growth of population over space and time leads to compactness and diffusion. Therefore, its nature is explained over space.

## 1.5 Approach to study

Geographers favour to study the phenomena from different approaches. Most popular approaches followed in Geography are functional approach, system approach, landscape approach, ecological approach, behavioral approach etc. Here functional, system and regional approach have been attempt to developed.

**Functional approach**

Decadal growth of population over space and time has been analyzed in relation to functional perspectives. Here statistical methods are used to define the growth function.

**System approach**

In a system approach the main aspect is considered as the totality which is constituted by components. In system approach of demography, here the district is considered as the system and the blocks are the component. The growth of the components is judged in respect to system.

**Regional approach**

In regional approach here the spatial pattern of population size, density, composition are reflected into regional units.

## 1.6 Location of the Area under Study

Bankura, occupying the central position in the western part of West Bengal, is the true representative of Rarh Bengal. The District is located between $22°38^/$ and $23°38^/$ North latitude and between $86°36^/$ and $87°46^/$ East longitude with the shape of an isosceles triangle. The total area coverage of the District is 6882 sq. km. The whole District is divided into three subdivision namely-Bankurasadar, Khatra and Bishnupur subdivision consisting of 22 blocks. The District is bounded by Burdwan in the North and North-East, separated by the Damoder River, on the South-East by Hooghly District, on the South by Midnapur and on the West by Purulia District.
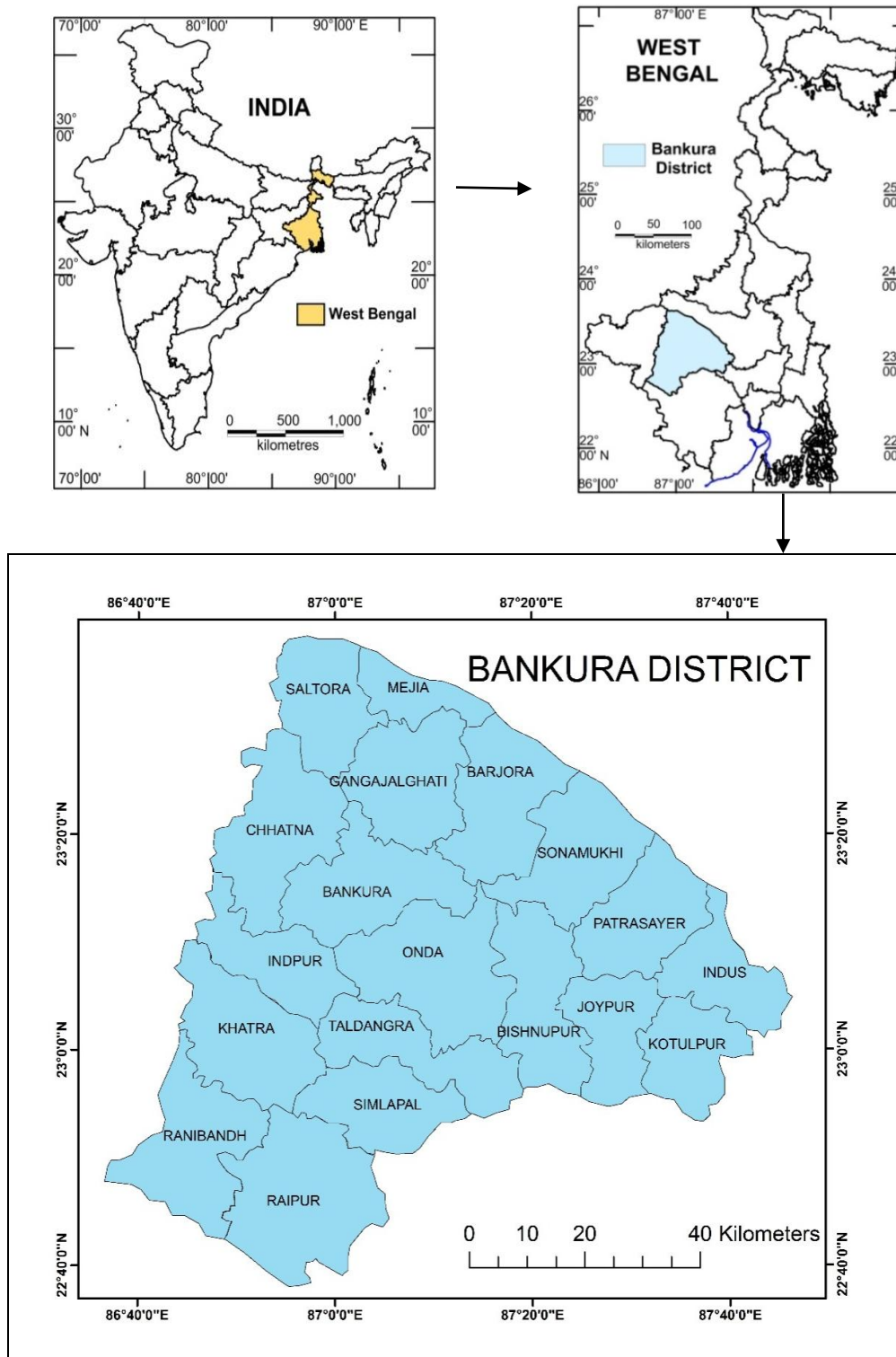
**Fig. 1.1** Location of the Study Area

The basic foundation is based on block level study. Presently there are 22 blocks, but to make a parity of investigation three new blocks have been merged and 19 blocks are considered for analysis.

## 1.7 Reasons for the Selection of the Study Area

Population growth and demographic dynamics of West Bengal and also other advanced districts as well as some backward districts like Malda, Murshidabad have been studied widely but Bankura and Puruliya have become silent relatively. Either in geography or in other social sciences demography or geography of population is least enquired because of its low response of population growth in different perspective, though poverty, livelihood, health and education have been focused scatteredly. Therefore Bankura district has been taken into consideration for the following reasons:

1. Population growth and demographic dynamics of West Bengal and also other advanced districts as well as some backward districts like Malda, Murshidabad has been studied widely but Bankura and Puruliya have become silent relatively.

2. Bankura for its physical location in Rarh Bengal reveals a less dynamic demography but its factors are not explained properly. The present study opts to analyze it in detail.

3. Urban population of Bankura has never crossed 10 % of the total population. Such a district with rural population base must be analyzed through rural population dynamics.

4. The most important aspect of this research work is to explain the demographic scenario in relation to human development.

5. Ultimately the present enquiry attempts to outline the factors for low population growth rate and HDI.

## 1.8 Objectives of the Study

Present enquiry has specific as well as clear focus concentrating on population growth and its reflection on spatial pattern and to underline the common goal-the perspective of human development. Therefore, the major objectives of this enquiry can be pointed up as follows:

1. To assess the population growth over time,

2. To assess the nature of spatial distribution and the rationale behind it,

3. To segregate the District in terms of population dynamics,

4. To find out the spatial attributes of population in relation to factors of development and backwardness,

5. To correlate the human development with human desire.

## 1.9 Research Questions

Research enquiry starts with a problem starts with a problem which is subsequently taken into enquiry to find out the nature and types of problems. Under the back drop of some questions the nature and types of problems are deeply investigated to attain the goal of research. This investigation also attempts to find out the answer of some specific research question for the attainment of goal of research. These are as follows:

1. What are the spatio-temporal dimensions of population growth of the blocks of Bankura District?
2. How these spatio-temporal dimensions of structure and composition of population are reflected into spatial demography over time?
3. What are the responses of the blocks in terms of growth relatives of the district?
4. What is the level of human development of the blocks and how are they correlated with socio-economic development and backwardness?
5. What is the future speculation for better socio-economic and human development**?**

## 1.10 Hypothesis Built up

Developing the research problems, questions, objectives and literature survey, the initial hypothesis taken for the present research is as follows:

> '*spatial mosaic of population growth and human development varies not only in accordance with topographic sequence of north-west to south-east conditioned by soil fertility, arable land but also socio-economic status of the blocks'*.

## 1.11 An Outlook to Enquiry

The whole enquiry will be unfolded in ten chapters of which eight chapters are very much important. The first chapter under the head of introduction provides structural framework and primary conception about the work. The second chapter is the foremost important in highlighting methodology of research work, wherein different quantitative techniques subsequently employed. We have placed spatial emphasis on the parameters of different types of regression equation which aim to highlight varied aspect of spatio-temporality of the population composition. The kind of relationship emerging out of the intercepts of size and density would be as curious

and intriguing as those obtaining from the rate of change of the same aspect in view of the different spatio-temporality of growth. Each statistical techniques of mean, standard deviation, coefficient of variation and standard scores discussed with allusion to its relevance to this study. System component analysis is justified to grasp the totality of the reality. This is enriched with literature survey from difference sources.

Third chapter attempts to unfold physical setup of the study area in terms of different factors of physical environment that certainly influenced demographic processes as well as socio-cultural outlook and economy of the study area.

Forth chapter tries to focus on the back drop of the thesis relating socio environmental status as well as the demographic perspective of the District. It is perhaps the most important jacket in guiding the future course of work.

Fifth chapter relates to population composition and growth of population. These are two important factors of demography which is the integral part of resource-population relationship as well as area-resource relationship which will subsequently be employed in spatial planning in the later section of the enquiry. This chapter concerns with a panoramic view of the decadal growth of the population size during the 1951-2011 period of each of the blocks in its first section. The second part of the chapter involves an identical examination of the density growth. The third section of the chapter is concerns with different segments of the society.

Sixth chapter aims to look into the spatial impact of temporal growth. This chapter focuses on the level of spatio-temporal concordance of the size and density.

Seventh chapter's major focus is regional mosaic analysis, where size and density of population is explained in terms of threshold and growth, as most important attributes of dimensions of demographic attribute. This promotes us to initiate a study of the change in demographic relief in the time span of 1951 to 2011.

Eighth chapter is very important to study the blocks in the system-component perspective where blocks are the component and district as the system. It also attempts to analyze area population relationship of the blocks indicating pressure of population on land over time.

Ninth chapter attempts to unfold human development in relation to socio-economic development with selected variables. It conclusively determines segregation of developed, partially developed and under developed blocks of the district.

The last chapter tries to scrutinize the essence of investigation and concluding remarks.

## 1.12 Limitations

Whole hearted attempt has been made to unfold the enquiry considering the research problem, objectives of studies, analysis of results and confirmation of hypothesis. But still this research work has faced some limitations which are left for the other researcher and some of the limitations are systematically articulated under the following points:

1. At present the Bankura has been classified into 22 blocks but at the base years of investigation it was considered by 19 blocks. So, data base of the new blocks has been added with the earlier blocks from which those have been originated. This is not a severe limitation at all but there is no other way to amalgamate these three blocks.

2. Non-availability of religious population is another point of limitation for which the religious population has not been reflected.

3. Occupational composition has been avoided carefully, due not only to re aggregation of occupational structure in 2001 census but also due to over population of primary workers for which other workers are subdued.

4. Migration of population has not been reflected not only due to the non-availability of block level data.

5. Human development of the blocks has not been assessed with the basic variables provided by UNDP, but it has more carefully treated with the data base of District Development Report (2006) where out of eight variables, six have been taken into consideration and that is more reflexive. Two variables have been avoided due to their heterogeneous response of human development. Precautions and attempts have been made to unfold the enquiry systematically keeping in mind about all those limitations. Therefore, all these limitations have in no way diluted the enquiry.

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## Chapter – 2 : Methodology

- Methodological Design

- Stages of Enquiry

- Data Base

- Techniques of Data Processing

- Dimension of review of literatures

- Uniqueness of the Study

# *Methodology*

Research methodology is the integral prerequisite of a thesis. Most simply research is considered as a process to articulate the research work systematically. It is a science of studying how a research work is carried on. It not only deals with the research methods or techniques but also considered the logic behind them (Kothari, 2004). Methodology scientifically organizes whole of the research work. Therefore, it explicitly incorporates structure, outlook, orientation and objectives of enquiry in a thesis or dissertations. For the present investigation the basic perspective of methodology includes methodological design, structure of research, and outlook to algorithm, data base, processing of data, objectives and report writing.

## 2.1 Methodological Design

Methodological design refers to the entire process of planning to carry out the research work. Here the whole methodological design has been represented by schematic diagram (Fig.2.1). It begins with the selection of research problem followed by successive steps-schematization, conceptual frame work, literature review, objectives, organization of chapters, stages of enquiry with collection and arrangement of data and lastly report writing with critical appreciation.

## 2.2 Stages of Enquiry

The whole stages of enquiry can systematically be subdivided into three distinct phases: pre-field, field and post field. All these three stages of enquiry are not mutually exclusive rather than inter dependent.

### 2.2.1 Pre-Field Stage

In the pre-field stages, topic and the study area are having been selected, followed by schematization and also the development of conceptual framework. Thereafter an exhaustive literature has been reviewed with the development of research questions and building of hypothesis as a priory. To take an field enquiry in relation to pilot survey as well as detailed investigation, well-knit questionnaires and survey scheduled have been done. The sample villages for primary data have been selected through random judgment sampling.
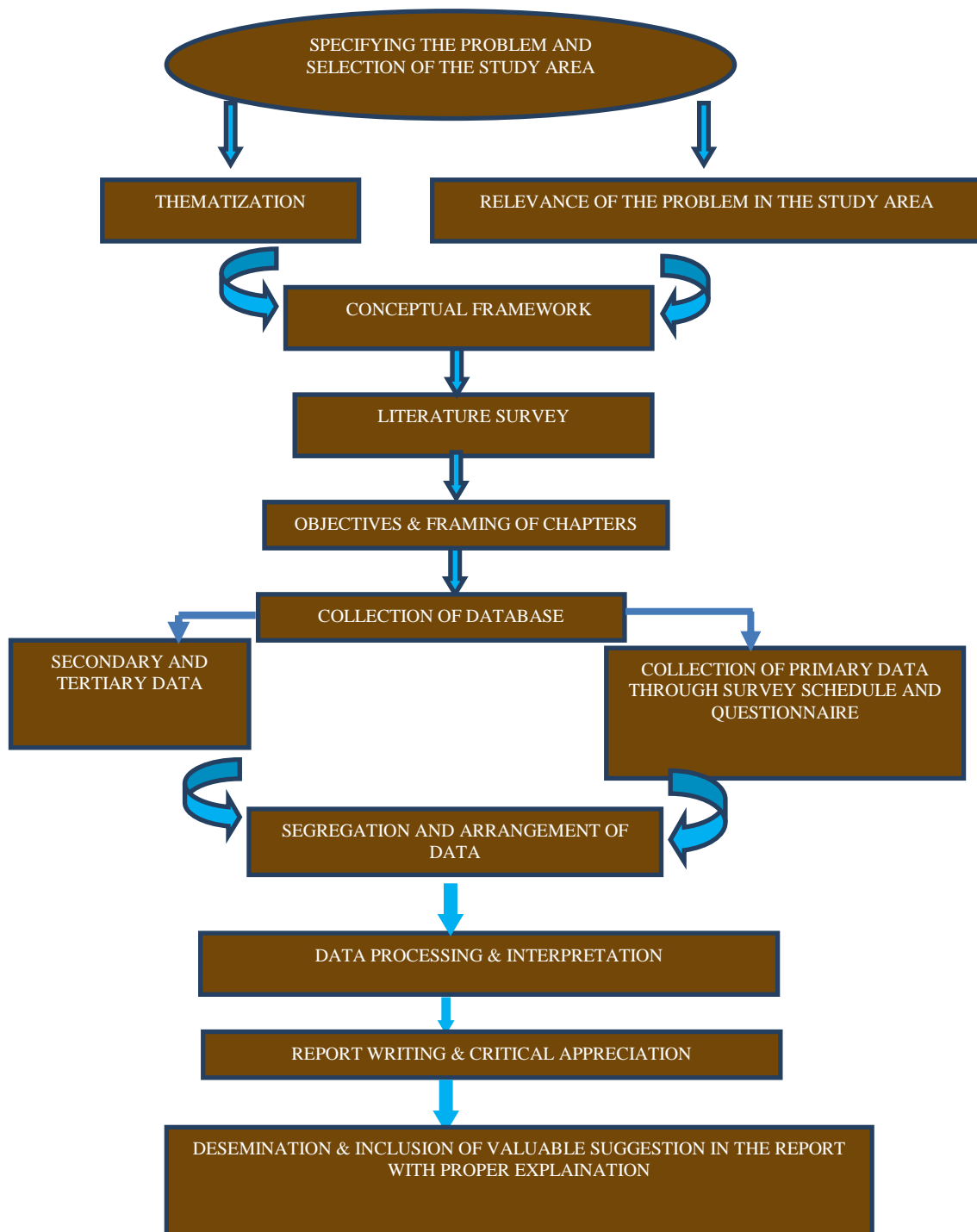
**Fig. 2.1** Methodological Design

## 2.2.2 Field Stage

Field stage considers mainly the data from different sources. Collection of secondary data in this stage, though primary data is essential to justify the reality in the micro level spatial unit. For the collection of primary data, additional information,

snow ball sampling is of crucial importance in gleaning out the reality of human development perspective.

### 2.2.3 Post-Field Stage

Post field is the ultimate orchestration of a thesis. It is impounded with organization and analysis of data and also analytical comprehensive report writing. As the thesis is intended to unfold population growth dynamics over space and time with the reflection of human development, the analysis is basically statistical to find out the coherence of space time population dynamics considering blocks as the basic unit.

Meaningful division of chapters and its concomitant inter related analysis are the main concern of this post field stages, which is ultimately turns out to be the essence of enquiry in the last chapter.

## 2.3 Data Base

The present research work concerns mainly block level analysis of population growth and human development. Secondary and tertiary data base from census of India, development report, Gazetteer, human development report, computed data of the researchers, district statistical handbook etc. are immense importance, though to glean out the reality of livelihood and human development primary data has been collected from nine villages. The whole data base of this inquiry can classified into four broad groups namely:

(i)     Historical data base,

(ii)    Qualitative data at macro scale,

(iii)   Quantitative data at macro-scale,

(iv)   Qualitative and quantitative data base at micro scale through questionnaires and

(v)    Perception oriented data.

### Historical Data base

To get a historical perspective of population, economy and society of the study area, qualitative and quantitative information has been collected from Bangal District gazetteers - Bankura (L.S.S O Malley, 1908), Bankura Janer Etihas Sanskriti (Choudhury, R.M., 2000), W.B District Gazetteers, Bankura (Banerjee, A.K. 1968) etc.

**Qualitative Data at Macro scale**

Qualitative data base at macro scale has been gleaned out from different books as well as research works on sociology, geography and economies. Research work of Choudhury, R.M. (2000) is an authentic data base of history, art and culture of Bankura. Similarly Sinha, M (2008) has widely investigated promotion of non agricultural activities in Bankura. She has carried out a research work on Women employment of Bankura District. Apart from this two research works, Atit Bankurar Artha Chitra by Choudhury, R.M. (2001) is an important source of qualitative data of the district as a whole as blocks of the district in particular.

**Quantitative Data at Macro Scale**

Quantitative data is perhaps the most authentic foundation of this enquiry to perceive the general outlook of the two blocks in terms of population, land use, agriculture, forest coverage etc. All these data base has been collected from the census reports of the district (Census of India from 1951 to 2011), District statistical Hand book (Govt. of West Bengal, 2005-2010).

**Questionnaires and Openionnaires**

Micro level primary data have been collected from nine selected villages from three different physiographic and socio-cultural regions of Bankura district to revile the reality of livelihood of common people and human development.

## 2.4 Techniques of Data Processing

Processing and treatment of data is of vital importance in the demographic analysis. Therefore, the quantitative data and in some cases qualitative data have been treated in different types of statistical and mathematical techniques to find out the spatial- temporal reflection of population change.

### 2.4.1 Qualitative Techniques

Qualitative data collected through perception survey are vital for understanding whether the people are satisfied with the facilities and services in relation to human development perspective like employment opportunities by the government, rationing system, role of representative in the democratic system in a

welfare state etc. In some cases, 3-point response (yes, no, don't know) has been collected to judge people's satisfaction about livelihood and human development.

**2.4.2 Quantitative Techniques**

Demographic analysis is well explained with quantitative techniques, though some qualitative techniques have been used to realize the spatial variation of human development and quality of livelihood at micro scale. Quantitative techniques applied here is of different types to judge the spatial variation, temporal change and system behavior of demography. All these techniques can be classified into four categories. These are: (1) Univariate statistics, (2) Bivariate statistics, (3) Multivariate statistics, (4). Cumulative score.

*2.4.2.1 Univariate Analysis*

Univariate statistical techniques have been used in different standpoints through elementary statistical tools like mean ($\bar{x}$), standard deviation ($\delta$), coefficient of variation (C.V.), percentage and z-score with firmly grounded reality. For substantial changes over space and time in any of these statistical parameters has been employed to make a deeper insight into the reality of demographic dynamics.

*2.4.2.2 Bi-variate Analysis*

Bivariate analysis is exhaustively used for temporal change of population with the help of linear and curvilinear regression and tested by coefficient of determination ($\mathbf{r^2}$). Linear regression of the form of $\mathbf{Y=a+bx}$ has been adopted mainly in order to perceive the temporal growth (decadal) during 1951-2011. Here the notion is to interpret the threshold (**a**) and rate of growth (**b**) – both in decadal growth of different blocks. The justification of linear regression is due to the steady growth of almost all of the blocks of the district. Linear regression is appropriate as the coefficient of correlation is very high (>0.97) for most of the blocks. To make a deeper insight into the reality of demographic dynamics, these parameters of size and density has been subjected to a sort of second order regression between threshold (**a**) and rate of growth (**b**). Rectilinear regression is appropriate here as second order value (**a** and **b**), are more or less steady rather than abnormal change. These parameters of size and density have been subjected to a sort of second order regression between threshold (**a**) and rate of growth (**b**). Rectilinear regression is appropriate here as second order value (**a** and **b**), are more or less steady rather than abnormal change.

Curvilinear regression is also applied here to perceive more accurate relation of scattered value of HDI. In most cases third degree polynomials in the form of **y=a+bx+cx²+dx³** (Yeats, 1968) seems to be best fitted, defined by the r²value. This is suitably employed for the HDI values of the blocks (based on block level parameters) and PCA score of development indicatory.

Another most important curvilinear regression has been rationally been employed in the form of **Y=ax$^b$**, where **a** is the threshold and **b** is the exponent depicting relative response rate of Y to the rate of change in X.

This type of equation has been employed for two different purposes. In the first instance **b** is highlighted for its critical reflection, while **a** is explained later on. This technique is very important for allometric growth (Coffey, W. 1981). The allometric growth refers to the study of size and its consequences, and related to the differences in the properties of one component of a system to change in either the absolute magnitude of the system or a second component of the system (Guchhait, S.K. 2005).

Allometric equation is familiarly described by a power function in the form of **Y=ax$^b$**. But for computational expediency, for this research work, district is considered as the system and blocks are the components. Here the value of **b** is of critical reflection as it indicates the value of less than one (<1) close to one (1) and more than one (>1). On the basis of these values of exponent three types of growth (may be more subdivision) can easily be detected in a system. Three basic categories are equally important in this regard. The first category with the exponent value of more than one (>1) is popularly known more positive allometry, conversely value of less than one is the negative allometry.

Curvilinear regression is also applied here to perceive more accurate relation of scattered value of HDI and socio-economic development. Here third degree polynomials in the form of **y=a+bx+cx²+dx³** seems to be best fitted, defined by the r²value. This is suitably employed for the HDI values of the blocks (based on block level parameters) and PCA score of development indicatory.

Another most important curvilinear regression has been rationally been employed in the form of **Y=ax$^b$**, where **a** is the threshold and **b** is the exponent depicting relative response rate of Y to the rate of change in X.

*2.4.2.3 Multivariate Analysis*

Assumption of spatial association is the basis of choice of the multivariate techniques in the present investigation since population growth and its relation to human development does not occur in isolation. It has its spatial associates, attributes and correlates. In other words, it situates itself in a s physical, economic, social and cultural milieu. Therefore, to glean out the spatio-temporal population change attempt has been made to employ widely used sophisticated technique of principal component analysis or simply component analysis which is based on the concept of multi co linearity rather than simple linearity of the multiple regression analysis. A brief outline of the principal component model of factor analysis may be in order here to appreciate the focus of the subsequent chapters since an exhaustive literature (Harman, 1960, Hotelling, 1933, Fruchter, 1954) can be easily accessed in terms of system and its attributes.

It is the object of component analysis to extract a variable Zj in terms of several underlying factors or logical hypothetical constructs. The simplest mathematical form for describing *a* variable in terms of several others is a linear one, and that is essentially the form of representation applied here. It is also true that there are still several alternatives within the linear framework, depending on the objective of the analysis. A distinction between two objectives can be made immediately such as: (1) to extract the maximum variance; and (2) to "best" reproduce the observed correlations.

An empirical method of the reduction of a large body of data so that a maximum of the variance is extracted was first proposed by Karl Pearson (Pearson, 1927) and fully developed as the method of principal components or component analysis by Harold Hotelling. The model for component analysis is simply

$$\mathbf{Z_j = a_{j1}P_1 + a_{j2}P_2 + \ldots\ldots\ldots\ldots + a_{jn}P_n} \ (_{j\,=\,1,2,\ldots n})$$

where each of the **$\underline{n}$** observed variables is described linearly in terms of $\underline{n}$ new uncorrelated components, **$P_1, P_2\ldots\ldots P_n$**. An important property of the method as far as the summarization of data is concerned, is that each component, in turn, makes a maximum contribution to the sum of variances of the n variables. For a practical problem only a few components may be retained, especially if they account for a large percentage of the total variance. However, all the components are required to reproduce the correlations among the variable.

Importantly component analysis begins with a data matrix recording the

magnitudes of selected variables measuring different individuals which, statistically speaking, represent different spatial units such as municipal wards, police stations or sub-divisions of a district, districts of a provincial state or the geomorphic units comprised of river basins  social area and the like.  In the present study blocks are the spatial units against which different demographic, economic, social and environmental variables are taken into consideration. It needs to be stressed that a data matrix having variables measured over different spatial units has two dimensions - the matrix and its transpose.

A principal component analysis dealing with the correlation matrix of the variables is generally known as R-mode analysis or R-technique which has been used in the vast majority of studies while the component analysis dwelling on the transpose of the same data matrix is labeled Q-mode analysis or Q-technique (Harman, 1960). It is also dealt with the data matrix involving the growth of population of the blocks at different decadal time points. In this case time points are variables while the units or individuals of observation remain the same, i.e., the blocks. Component analysis dwelling on the correlation of occasions or time points measuring the change goes by P-technique but the one based on the transpose of the spatio-temporal data matrix is named O-mode or O-technique analysis (Fruchter, 1954). One can, therefore, understand that P-and-O-techniques are the temporal equivalents of R-and-Q-mode techniques. For the present context, Q and R techniques are employed. To dig into the nature of development as well as backwardness and its attributes and correlates this enquiry has exhaustively used R-Q-and-O-P-techniques of component analysis. In a gist R-mode analysis aims to seek out the spatial dimensions and the latter two look for spatial continuum of the spatial units in terms of the variables over space and time.

Irrespective of the technique the principal component analysis is basically a four-stage method-1) Construction of a meaningful data matrix, 2) Computation of the correlation matrix, 3) Extraction of principal components or factors , 4) Measurement of the factors against the units of observation or the variables depending on the technique employed, 5) Dimensional representation of variables and spaces through biaxial framework, 6) extraction of Z-score of variables and spatial units and 7) ultimately representation of spatial pattern in relation to variables.

Statistically speaking, every extracted component is an eigenvector, which is a combination of **n** variables depending on their degree and direction of their mutual

relationship, which is multidirectional. Therefore, each vector indicates a particular dimension of the relationship and the strength of the associations is defined by the eigen value of each vector which tends to fall off sharply when the matrix of correlation coefficients records moderate to strong relationship irrespective of the direction; it should be mentioned here that the sum total of eigen values is equal to **n** variables of **m** individuals depending on the mode of analysis. This theoretical reality prompts the initiation of the fifth stage in the component analysis by recourse to a regression analysis of the elements of the first two eigenvectors (if it is able to explain 67% of total explanation), which together are found to account for a large percentage of variance in this perspective. Since the second component is extracted from the residual matrix obtaining from the subtraction of the product matrix from the initial matrix, it has the property of reflecting a different dimension from the first one though in the process eigen value has sharply dropped making it much less important than the first one in respect of the percentage of variance explained. This essentially justifies the subsequent decision to construct the composite index on the basis of the first principal component and identify and classify the districts accordingly. Similarly, in the case of the transpose of each data matrix following the same process has been followed to point up the relative importance of each variable in combination with others.

*2.4.2.4 Cumulative Z-score*

Cumulative Z-score is an important technique, widely applied in Geography transforming different variables into a uniform score to portray the spatial variation under certain dimension. Here the technique is applied in finding out the z-score of different variables considered under the perspective of economic development as well as backwardness of study area in terms of spatial mosaic.

## 2.5 Dimension of review of literatures

Review of literatures in thesis enlightens the dimensions of research in a particular context and also helps to find out the research gap that is realized for subsequent development of knowledge in that field (Randolph, 2009). Review of literature is essential as it adds new information to the present investigation considering the level of enquiry and gaps found in the earlier related works. At present review of literature In population geography considers a wide variety, in terms of population growth, pattern, spatiality, livelihood, welfare, problems, migration,

health, mortality, morbidity, food security, housing, slums, urban population dynamics, rural population dynamics and a lot of other. But present investigation opts to analyses basically spatio-temporal growth of population of Bankura district after independence. Therefore review of literatures considers mainly spatio-temporal growth of population, spatial pattern of population growth, system component growth perspective of population and ultimately population growth and human development.

## 2.5.1 Literatures Related to Population growth and spatial pattern

Guchhait, S. K. (2005) has outlined the population growth and its spatial pattern in West Bengal from 1901 to 2001 in which aspect of growth, spatiality of growth and attributes of population dynamics has been widely discussed in terms of different quantitative techniques. He has taken into consideration, birth rate, growth rate and absolute population mainly with a reflection of urban population and impact of migration after partition of India. In such a large scale study, absolute population, birth rate, death rate and migration is enough to portray the reality of growth over a century. Such a study is entirely based on secondary data. But a district level study cannot be comprehended only with those parameters.

Present investigation opts for such analysis in terms of aspect of population growth and also the system component growth but a district level study cannot be systematically represented without the structure and composition of population and its spatial pattern. Apart from basic unit of study here are the blocks; therefore, next lower order has been taken into consideration for the system component perspective of population growth.

In analyzing the relation between Resources and population Ehrlich, R. and Ehrlich, H. (2016) have critically analyses the population where crisis and growth of present day economy and environmental challenges are widely discussed. This is undoubtedly a seminar paper in a globalised model of population related issues like climate change, its impact on resources, growth of present day economy and its future consequences.

The dimensions consider here are important for any thesis related to population. Therefore in analyzing the resource perspective and population growth of the present enquiry, the issue has been taken care of. Being a purely agriculture dominated district, the resource potential is not confined only I agriculture at present; rather mining and urbanization are prompting more and more that have been assesses in different measures.

Portraying the spatial pattern of population growth a handful of techniques have been incorporated from Coffey, W (1981). Such a book is essential I incorporating the ideas of system-component perspectives, area-population relationship etc. With those techniques the relative growth of the I respect to the district is widely analyses where the power function of system component growth and also the power function as well as threshold values of area population relationship are suitably defined and explained; thereafter role of growth in future periods is assessed in relation to future population resource relationship.

## 2.5.2. Literature Related to Human Development

Seminal paper of Ranis, G. (2004) is an important source of perceiving economic growth and human development. Ranis have critically discussed the human development in relation to economic growth. He has rightly uploads the Sen.'s view, person's capability to have various functioning vector and to enjoy the corresponding well being achievements' to be the best indicator of welfare. This perspective shifts the analysis of development to the vector of not only attributes e.g. income, education, health, but also the vector of possible opportunities available to individuals in a particular state. Therefore, Ranis has analyzed linkage between income, education and its impact on human development. He also emphasis the effects of economic growth on Government human development expenditures are bound to compliment private expenditure channels. He also considers intra house hold income distribution on child welfare following Hoddint and Hadded (1991).

Thesis has therefore incorporated economic development perspectives considering different variables and thereafter correlation is ascribed with human development.

Ranis, H and Stewart, F. (2000) has elaborately discussed critically the human development with economic growth with dummy variables for Africa, South Asia and middle east with the quantitative analysis confirming the results with intercepts, adjusted r-squared, T-statistics. Thus he confirms that countries initially favoring economic growth lapse into the vicious category, while those with good human development and poor economic growth sometimes move into the vitreous category.

In this thesis, economic development in relation to the selected variables not also confirms with the human development while correlation is established. Middle tier blocks are showing departure from the trend value.

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## 2.6 Uniqueness of the Study

Demography of Bankura as a district and blocks are almost left in the research area. Researcher, Government organization, NGOs have been taken enquiry of Bankura in terms of population perspective, relating to poverty, education, health, human development, welfare, employment, morbidity etc. But demography of Bankura as is crude form of spatial enquiry with respect to size, density, composition and its spatial pattern of human development have not been enquired for this district so far the literature survey is considers. Another uniqueness of this enquiry is that spatial pattern of system component growth perspective of the blocks have appeared almost in the same tune of topographic barrier or contour profile of the district. With a clear cut north-west to south-east trend. Therefore planning in the district level not In block level must be viewed in the system component perspective where more priority must be given for the western blocks. After all this research enquiry have attempt to fold demographic dynamics of the district from general to particular and ultimately in a system dynamics.

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# Chapter – 3 : Physical Setup of the District

- Physical Landscape

- Physiography at a Glance

- Climate

- Soil

- Natural Vegetation

# *Physical Setup of the District*

Physical landscape provides the initial foundation of this investigation, as population growth and human development can better be understood with the reality of physiographic, climate, soil, vegetation, water resource. Those essentially the fundamental geo-environmental factors are influencing population growth, migration, livelihood, human development etc. Physical resource base signifies the potentiality of resource development in a rural landscape-the basic foundation of livelihood of the rural people of this area.

## 3.1 Physical Landscape

Curving out the physical landscape of the study area, it is pertinent to make the glimpses of the landscape of the whole district at first and the specific region thereafter in terms of landform, climate, soil and water bodies of the study area in order to articulate the resource base of the study area in relation to rural livelihood.

## 3.2 Physiography at a Glance

The District Bankura is included in the Burdwan division of West Bengal and located in between 22°38$^/$ N to 23°38$^/$ N latitude and 86°36$^/$ E to 87°46$^/$ E longitude. The district, according to the census of 2011 has a total area of 6882 Sq. Km and total population of 3596674 persons with a density of 523 persons/Km$^2$. The district forms an intermediate track lying between the rice producing alluvial plains of West Bengal to the east and the Chotanagpur plateau on the West. The district may be divided into three topographic regions: the plateau area characterized by rocky outcrops with small hills and hillocks in the West, undulating plateau fringe in the middle, and slightly undulating plain in the North-East. The district Bankura is designated by geographers as the centre of *Rarh Bangla* with huge lateritic cover interspersed by rocky outcrops and transitional plain, where the prospect of agriculture is low except the region of eastern plain plateau transition. The principal rivers of the district are the Damodar-once the sorrow of Bengal (now the almost decayed channel due to DVC planning), the Dwarakeshwar, the Kangsabati, the Kumari, the Gandhaswari, the Joypanda, the

Silabati, the Sail etc. Two marked hills-the Susunia and the Biharinath stand apart in the North West and the south west margin of the western part of the district.

**3.2.1 Surface Geology and Topography**

The greater part of the district is covered by laterities and alluvium, while the gneiss and schistose rocks of Archaean age occurs in the western part of the district forming the easterly continuation of the immense area of similar rock in Purulia and Chhotonagpur. In addition, sedimentary rock of Gondowana system forming the southern part of the district between Mejia and the Biharinath hill, contain some useful seams of coal. A number of dolerite dykes of Mesozoic age cutting across Gondowana rocks and Archaeans are found in the north-western parts of the district.

The Archaean rocks are dominantly gneissic which are cut across in places by granites, pegmatite and vein-quarts. Small pockets of limonite and titaniferous magnetite are associated with the anthracites- composed wholly of the feldspar and labradorites. Good out crops of hornblende-gneisses, traversed by granite veins, are seen in Bankura town and to its west and south-west, while to the east the gneiss becomes gradually covered up with lateritic and sandy clays.

Another feature of geological interest is the felspathic quartzite forming the top of the Susunia hill. The southern parts of the district contain mica-schists and Phillies which are nothing but the continuation of the iron ore series of Singhbhum and Purulia. At the trijunction of the districts of Bankura, Medinipur and Purulia, there is an elliptical area of gniesses granite (known as Kuilapal granite). There are abundant dykes of pegmatite in the granite body; small deposited of muscovite mica occurs in the pegmatites.

Laterite interspersed with sand and gravel forms the most characteristic geological feature of the district. There are two types of laterite, viz. The in situ laterite which forms hard, massive beds and blocks and originate by residual weathering of underlying rocks, and the laterite gravels which results from decomposition and rearrangement of the materials of the massive laterite. The laterite gravels show all gradations to coarse sandy clay containing only a few ferruginous nodules. In this case calcerious kankar is also frequently associated. Laterite does not cover any large area in the north, although it can be seem near Barjora and in thin small patches near Bankura town. Recent alluvium covers major part of Bishnupur subdivision in the east. Among minerals of economic importance, the occurrence of

coal in the extreme north and the deposits of wolfram at Ranibandh police station are worth mentioning. The quartzites of Susunia hill are suitable for use as paving stones and china clay occurs at a number of places associated with the Archaean rocks.

The area forms an intermediate tract lying between the alluvial plains of Bengal to the east and the Chhotonagpur plateau in the west. The area may be broadly described as a level    materially different from the flat plains in the adjoining districts of Burdwan and Hooghly. Along the western part, the surface rises gradually to the undulating plain    still    become still more pronounced towards the    district and ultimately Chhotonagpur plateau is extremely heterogeneous soil.

### 3.2.2 Natural Division of Landform

The district is consisting of two distinct tracts. The western portion marks the first step of the gradual descent from the tableland of Chotonagpur to the delta of lower Bengal, consisting of spurs projecting from the western table land and of two swelling-ridges of laterite. In the central portion of the district, the country is more open and consists of a series of rolling uplands and isolated hill to the west has been well described by Sir Willium Hunter.
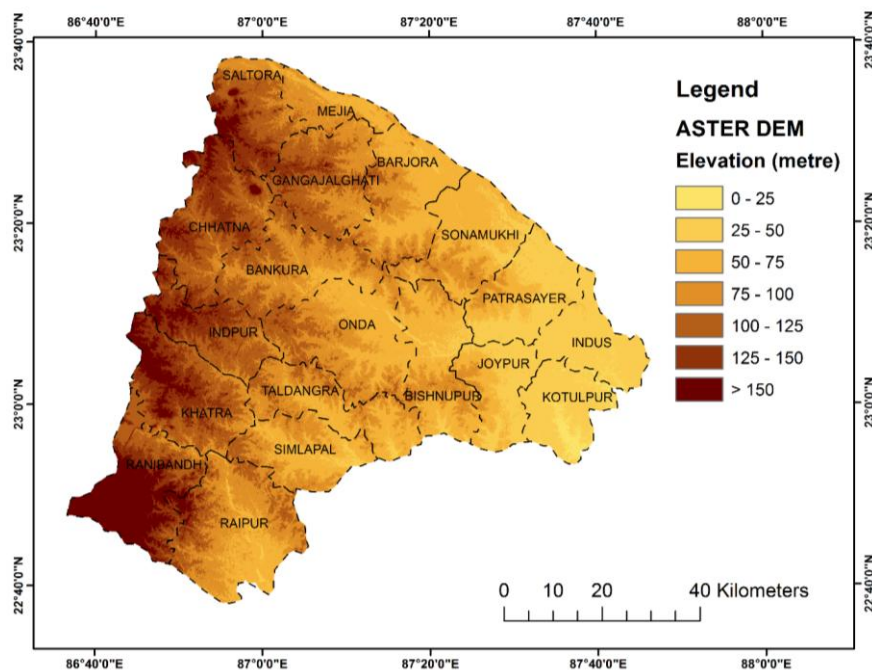


**Fig. 3.1** Topography of the Study Area

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The hills of the district are Chotonagpur plateau and only two arc of any great height, viz Susunia and Biharinath. Susunia which is about 14 miles North West of Bankura, runs almost the east and west for a length of 2 miles and rises to a height of 1442 feet above sea level. It is almost covered the forest area. The Biharinath hill is situated in the north-east corner of the district with a height of 1469 feet. There are several low hills in the Saltora outpost in the north-west are Mejia and Kora. The Mejia hill is situated on the south bank of the Damodar river. The Kora hill with a height of about 350 or 400 feet lies about half way between Mejia and Bankura town and close to the Bankura- Raniganj road. In the south, there are low but picturesque hills in the Khatra and Raipur thanas, of which one is locally known as Masakar pahar.

### 3.2.3 Drainage

The district is bounded on the north by the Damodar river and is intersected by a number of river flowing from north west to north east in courses roughly parallel to one another. They debouch from the western hill streams, which come down in flood after heavy rain but subsides as rapidly as they rise. Their beds are sandy and in the summer months nearly everywhere is dry up. The main river flowing in this district is Damodar, takes its rise in the hills of Chotonagpur and touches upon the Bankura district just after it has received the water of the Barakar. It then flows in a south-easterly direction, forming the boundary between Bankura and Burdwan for about 45 miles. The course of the river is tolerably straight, but it is full of sand banks. From the middle of July till the middle of October, during the rain, Damodar is liable to heavy flood in the lower portion of the course.

The chief tributary of the Damodar is the Sali, which rises a few miles west of Kora hill and fall into the Damodar at the village of Samsar in Indus police station. This river drains a large portion of the north of the district.

Another most important river is Dwarkeswar or Dhalkisor. This river takes its rise near the Tilabani hills in Manbhum district and flowing south-east enters the district of Bankura near Dhumka in Chhatna police station, in the lower portion of its course, after its confluence with the Silai on the border of Midnapur. During rainy season, it is subjected to heavy floods and is often an impassable torrent.

During the course through the district the Dhalkisor receives many tributaries, the principal of which are Gandheswari, the Kukra and the Birai.

The river Silai or Silabati rises in the Manbhum district and entering bankura near Salanpur in Khatra police station. There are some small but picturesque waterfalls along its course near Hansara. The river Kasai or Kanshabati enters the district near Bamandihi in Khatra. It is only the river navigable during the rains besides the Damodar. There is also a minor river in Raipur called the Bhairabbanki, has a course of a few miles in the district. There are no natural lakes except a large swamp called the Mejia bill in Mejia police station. Springs are common throughout uplands.

## 3.3 Climate

The average annual rainfall in the district is 1443mm for the last eight years. The area receives the major amount of rainfall during the period of South-West monsoon. During the hot weather season, there is some amount of rainfall due to occasional depression coming from the south. In the winter season, the rainfall is less than    .

With the increase of temperature during summer the rainfall is so increases, caused by Norwester, but the average rainfall for the whole district comes to only    .

The average annual rainfall varies from 1211mm (2004) to 1803mm (2007) for the last eight years. There is a decrease of rainfall from east to west which is more conspicuous in the northern part of the study area while in the southern half, rainfall is more or less uniformly distributed. The pattern of isopleths is being controlled by storm tracks, distribution of natural vegetation and also by source of rivers through which Bay disturbance penetrates into the country. The period from March to may/June represented the summer. The south west monsoon occurs from June/July to September and the interval from October to the first half of November constitutes the post monsoon period.

Temperature starts rising rapidly in the area from the beginning of March. The summer heat is particularly oppressive due to the high moisture content in the air. Occasionally the maximum temperature rises to 45$^o$C with the onset of the south west monsoon by about the first week of June, the day temperature drops appreciably, but the night temperature continues to remain high, because of oppressive humidity. The

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weather is very uncomfortable during the monsoon season. The monsoon stops in early October when temperature begins to fall. November is the coldest month in the area with the mean daily temperature of 12 to 13 °C. According to E.M. Crowther's leaching factor, the district receives very little leaching during the prolonged summer season. During the south west monsoon, thorough leaching occurs within the soil profile.

High temperature and rainfall favors the degree of decomposition of rocks. As a result, the bases are released and upper horizon become rich in iron and aluminum as all other bases are leached out easily because of precipitation, high temperature and moisture content of the areas accelerate the humification and mineralization which keep the surface lowering organic matter and organic carbon.

## 3.4 Soil

The western part of the district has poor ferruginous soil and hard beds of lateritic with scrub jungles of sal woods. Long broken ridges with irregular patches of more recent alluvium have marked almost everywhere. During the long dry season, large extent of Red soil with hardly any trees tends the country a scorched and dreary appearance. In the eastern part, eye constantly rest on wide expenses of rice fields, green in the rain but parched and dry in summer.

## 3.5 Natural Vegetation

The Bankura district is well marked for its forest resources which have much significance in regard to the concentration of tribal population in the region. The tribal are preferred to live in the forest areas and thus an assessment of the vegetative cover becomes important in the present study.

The forest covers about 1450 sq.km which is about 20.4% of the total area of the district. The forests are mostly developed in the westerns part. The shapes and size of the forest belts vary widely from place to place depending on the configuration of the terrain. In general, the uplands, the hill slopes and the ridges are forest clad while the low-lying areas and the gentle slopes with a deep cover of soil have been brought under the plough. Pressure of population is also a cause of extension of cultivation across the forest fringes in productive areas. As a result, the forest of Bankura is characterized by a lack of compactness.

The detailed description of the physical characteristics show remarkable spatial variations from western part to the eastern part and it has also been observed that tribal live in high concentration in the region having unfavorable physical condition.

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## Chapter – 4 : Socio-Economic Perspective

- Historical Perspective of Bankura District

- Agriculture

- Industry and trade

- Transportation

- Community structure

- Caste

# Socio-Economic Perspective

Perspective of population in geographical inquiry cannot be completed at all without the socio-economic perspective of the area because people constitute the society, developed the culture and economy seems to be the fundamental of survival. Therefore, population growth, spatial distribution of population, birthrate rate, death rate, migration, health, education, human development etc., are directly or indirectly influenced by the socio-economic perspective of the area.

## 4.1 Historical Perspective of Bankura District

The district Bankura is designated by geographers as the centre of *Rarh Bangla* with huge lateritic cover interspersed by rocky outcrops and transitional plain, where the prospect of agriculture is low except the region of eastern plain plateau transition. The principal rivers of the district are the Damodar-once the sorrow of Bengal (now the almost decayed channel due to DVC planning), the Dwarakeshwar, the Kangsabati, the Kumari, the Gandhaswari, the Joypanda, the Silabati, the Sail etc. Two marked hills -the Susunia and the Biharinath stand apart in the North West and the south west margin of the western part of the district.

In terms of peoplescape of the district, Bankura is worth mentioning. Archeological evidence supports the existence of older civilization in Bankura district nearby Biharinath hill. As early as in 1865, V. Ball, an eminent geologist has reported the existence of a number of Paleolithic implements made of gneiss and quartzite in different sites of Purulia, Bankura and Bardhaman districts. Ball discovered Paleolithic tool, made of quartizite near the village of Gopinathpur, 11 miles south west of Biharinath hills of Bankura District (Gazetteer, Banerjee. A. 1968). Another exploration carried out in 1962 by D. Sen mainly in the Dwarkeswar valley, immediately south-west of Bankura town, clearly proves the existence of Paleolithic tools and implements.

Two geographical regions can be marked in terms of artifacts. The first lies in the valley of the Kangsabati and the Kumari where palaeoliths have been discovered from the villages of Ambikanagar, Hatikheda, Chiada, Baddih, Puddih, Pareshnath, Mukutmunipur, Sarengarh, Basnatapur etc. The other region is the Darakeshwar valley from the villages of Aista, Dhaldanga, Damadarpur, Namjura, Kriahnanagar, Nuniabad, Bhutsahar etc (Hunter 1875).

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The discovery of microlith in Bankura district was first reported by Haru Chakladar in 1952. Krishnaswami also discovered a large number of microlith tools and implements from 24 places, situated either in the Kangsabati- Kumari or in the Dwarakeshwar basins. Most of these places are either situated on the banks of the Kangsabati in Khatra police station, or are situated on the banks of the Kumari in Ranibandh police station. All these tools were found at the junction of red alluvium, the Archacan bedrock and modern grayish loam (Banerjee A. 1968). Pottery of any variety was conspicuous by its absence.

The history of Bankura, so far as it is known, prior to the period of British rule, is identical with the history of the rise and fall of the Rajas of Bishnupur, said to be one of the oldest dynasties in Bengal. Raghunath Singh was the first king of Bishnupur –as told by Dr. Hunter in his work"Annals of rural bengal". The rajas of Bishnupur called themselves Mallas (an aboriginal title) for many centuries before they assumed the Kshattriya title of Singh. The country over which these Rajas ruled is called Mallabhum, a term now used for the tract of country comprised in the thanas of Bankura (excluding the Chhatna outpost), Onda, Bishnupur, Kotulpur and Indus, the term Mallabhum is said to mean the land of the wrestlers, because the first Raja received the title of Adi Molla from his skill in wrestling.

## 4.2 Agriculture

Agriculture is the main stay of the economy of the district like the other rural areas of West Bengal. About 80 per cent people of the district dependent on agricultural activity but infertile soil, insufficient irrigation and frequent draught are certainly the barriers for the non-prosperous agricultural profile of this district. The district has a considerable natural forest cover with a total area of 1450 Sq. km amounting to 20.4 per cent of the total geographical area. Sal (Soria), Piasal, Palas, Kend, Asan, Behera are found to be the main tree species of this area. Tribal people in and around the forest area are highly dependent on the forest and forest resources. All most all the cooking fuels required for the tribal peoples are collected from the forest. Even forest leaves, fruits, tubers, roots and flowers are source of their food and medicine. Even today, tribals are to a great extent dependent on forest based on medicine. They have a considerable knowledge of bio-medicine by dint of their traditional ecological knowledge.

### 4.2.1 Agricultural Land Use

The economy of the district is predominantly rural in nature. Agriculture is the principal source of income for livelihood. Agriculture is the main socio-economic activity. District Bankura lies between the Chhotonagpur plateau and rice producing alluvial plains in the lower Gangetic delta. Broadly the district is sub divided hilly tracts of the west, undulating tract of the middle and the level alluvial planes to the east. Agriculture is controlled by several physical factors. Among them rainfall, temperature and humidity are important. Another important factor is altitude which is accompanied by various complex landform, hydrology, soil combination etc. All these physical factors are influencing the farming system of the district.

### 4.2.2 Agricultural Production and Productivity

Eastern and Southern part of this district is more productive than western part. Use of fertilizer, improved seeds, organic manure and pesticides are increasing day by day. Net cultivated area of this district is 5355 sq. km and total number of agricultural workers are 957097 (PAO, Bankura, 2011). Due to continuous division and fragmentation of cultivated land agriculture is less remunerative. About 46% of net cropped area is under irrigation.

Rice is the main crop of the district. Though the district is prone to drought, it can raise surplus food production in years of good rainfall. Most of the pre kharif and kharif paddy are grown in rainfall condition. HYV crops occupy very low area coverage in the district againest100% in the Summer Rice.

Other major crops are potato, wheat, vegetables, mustard etc. The district is lagging behind in the production of pulses and oilseeds. Wheat is the second most important cereal crop in the district and this crop is cultivated in limited irrigated areas. Among different oil seeds, mustard and rape are grown. Beside this, sesame is also cultivated here. New varieties of pulse crops like Arhar, Lentil, Gram, Kalai, Moong are introduced. Ground nut and sunflower are also introduced to meet up the gap between demand and production.

### 4.2.3 Irrigation Facilities

There is a good surface irrigation network under the commands of Kangsabati and Damodar canal irrigation system. More over there is also a good network of River Lift Irrigation (RLI). The district is drained by mainly rain-fed rivers, so a huge part

of the district is left dry for a long period during the year. Therefore, various types of micro irrigation projects have been taken up for those blocks having huge irrigation deficits, such as construction and renovation of check dams, construction of irrigation channels, protection walls for riverbeds and excavation of water bodies were some of the focus areas for Irrigation Action Plan 2011-12.

Sources of irrigation used for cultivation are lift irrigation, deep tube wells, mini deep tube well, shallow tube well, tank, dug-well auto flow, Kangsabati and DVC canals. Besides ground water irrigation, tank is another mode of irrigation. There are many natural and manmade tanks among which the tanks dug by the Malla kings are important.

## 4.3 Industry and trade

It is one of the most backward districts of the state of west Bengal. The district is characterized by low industrialization with high dependence on agriculture. As such the state government in its incentives scheme has placed Bankura district in 'c' category. The district is devoid of any large scale industries and the rate of growth of small scale industries is also not satisfactory.

Bankura has a position in weaving sector of West Bengal. All over the district, around 20000(census 2001) people are engaged in weaving sector. Sonamukhi is known as the village of weavers and the district has a Tasar silk weaving platform. The tribes of the study area used to collected Tussar silk worm from the local forest and sold them to the substantial merchants, are retailed them to hand of weavers of fabrics mostly weave consisted of tussar silk (Mukherjee, 1905). Other important industries are conch shell industry, bell metal and lantern making industry.

## 4.4 Transportation

Transport and connectivity is an important factor for the economic and cultural growth of any place. Bishnupur and Sonamukhi are attractive for ancient temple, handicraft and handlooms. Tourism is an important source of income. So transport and connectivity are important.

Bankura, Bishnupur are important rail stations in south Eastern Railway division. These stations are well connected with Kolkata and other places of India. Bishnupur is 200 kms away from Howrah and 84 kms from Kharagpur. Different

places of the district are well connected with different parts of the state of West Bengal, Bihar, Jharkhand and Orissa. NH-60 (Baleswar to Raniganj) road passes through Bishnupur town. State High Way 2 directly connects Bishnupur with Kolkata.

## 4.5 Community structure

Ethically, Bankura may be described as a border district lying between Chhotonagpur, the home of aboriginal races and the Gangetic delta with its old Hindu population. Even within the district it there is a notable difference between the Bankura subdivision to the west and Bishnupur subdivision to the east. In the former aboriginal races, such as Santhals, Bouris, and Bagdis predominant while in the later pure Hindu castes such as Brahmans are found in greatest strength.

### 4.5.1 Religion

The study area was never under any direct control of any Muslim ruler and the Malla kings were Hindu by religion. So the study area is Hindu dominated. The religious structures of the study area are as follows:

*4.5.1.1 Hindu*

In Bankura, lying as it does, between the highlands of Chhotonagpur, the home of Animistic races, and the civilized Gangetic Valley inhabited by Hindus, the Hinduism of the lower classes exhibits a marked mixture of the Animism of the aboriginal races and the higher monotheism of the Aryan Hindus. A very large portion of the population  consist of semi-Hinduized aboriginals, such as the Bagdis and Bauris, whose religion  is compounded of elements borrowed from orthodox Hinduism and survivals from the mingled Animism and nature-worship of the pure aboriginals.

*4.5.1.2 Muhammadans*

Muhammadans are found in greatest strength in the Bishnupur subdivision and specialy in the thanas bordering on Burdwan viz. Kotulpur and Indus, which account for nearly one half of the total number. They are Sunnis belonging to the Hanifi sector, and the majorities are believed to be descendants of local converts. The veneration of pirs or saints is common among the local Muhammadans, who frequent their shrines and make offering of sweetmeats.

Of the total number of population, no less than are Sheikhs and the number of Mughals and Pathans is very few. The animists are almost entirely represented by the Santhals.

## 4.6 Caste

Total population of the study area is 3596674 in the year 2011. Percentage of scheduled caste is 33.53% and scheduled tribe is 10.25% of the total population (Census, 2011).

Taking the district as a whole, castes and tribes of aboriginals or semi aboriginals are most numerous. The most predominant aboriginals of the area are Bhumij, Deswali, Manjhis, Santhals, Bouris and Bagdis. The Santhal, Bouris and Bagdis alone account for over one-fourth of the total population.

### 4.6.1 Santhal

Though for away from the main body of the race, they have preserved many of its distinctive customs and the old tribal life has to a certain extent remained intact. They still largely talk Santhali, a language which was not taught in the school in the district and the boys and girls are handicapped badly in having to take their examinations in Bengali. They had a peculiar skill in converting jungle and waste land into rice fields. They have a well established and fairly complete system of self government. The head man of each village, which is known as the Manjhi. The internal structure of the race is also well preserved.

### 4.6.2 Bagdis

The bagdis are caste of non-aryan origin, who account for their genesis by a number of legends. One of these is to the effect that they originally came from Caoch bihar and were the offspring of Siva and Parvati. The bagdis divided into the following sub castes:1. Tentulia, 2. Kasaikulia, 3. Dulia, 4. Ujha, 5. Machhna, 6. Gulimanjhi, 7. Dandamanjhi, 8. Kusmetia, 9. Mallametia. Bagdis practice both infant and adult marriage indifferently. Most Bagdis are to some extant engaged in agriculture, usually as Korfa or under-ryots. Large number of Bagdis are work as

landless day laborers, paid in cash or kind or as nomadic cultivators, tilling other man's land on the Bhag-jot system. Their social rank is very low.

### 4.6.3 Bouris

The Bauris are low aboriginal caste who works as cultivators, agricultural laborers and Palki bearers. They are divided into the following nine sub castes: 1. Mallabhumia, 2. Sikharia, 3. Panchakoti, 4. Mola, 5. Dhulia, 6. Malua, 7. Jhetia, 8. Kathuria and 9. Pathuria. The bauries are addicted to strong drink.


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# Chapter – 5 : Demography of Bankura District in General

- Demographic Backdrop of Bankura District
- Population Growth and Index of Decadal Size Growth
- Index of Density Growth of the District

# Demography of Bankura District in General

Population growth of an area over a period of time is likely to create dynamic spatial mosaic. Such spatio-temporal demographic dynamics may simply be perceived as a general outlook with some particular focus of population growth and its nature through growth rate, index of growth, population size and density growth of population in the concern area through different statistical measures. All the different measures prompt concentration, de-concentration of population in different segments of the area over time. In this chapter a generalized attempt is taken into consideration to capture the reality of the district and the blocks in terms of growth rate, index of growth, population size and density growth of population of Bankura district from 1951 to 2011.The district apparently silent up to 1981, is showing spilling of population in different parts, except the Western most blocks marked by hilly terrain, forest cover and thinner soil surface.

## 5.1 Demographic Backdrop of Bankura District

In the demographic perspective of West Bengal, Bankura and Puruliya are the two misfit districts as they response in a low tune in contrast to the rapid pace of demographic change of the state (census of India, 2011). West Bengal for the first time earned the dubious distinction of becoming the most densely populated state with a density of 767 persons per square kilometer in 1991 (Guchhait, S. K. 2005). In 2001 census, it held its position with a density of 903 persons per square kilometer, but in 2011 census, it has been dethroned by Bihar (1102 persons per square kilometer) with a density of 1029 persons per square kilometer (Census of India, 2011), Under such a backdrop population density of Bankura district is far below in reference to these three census years, representing almost half of the density of the state. Such a distinction is due to its location in the plateau fringe location characterized by relatively low rainfall, stupendous rocky surface and infertile soil that hinders immigration with a slow speed emigration. Within this silence response of demography, the district represents a diversified spatial mosaic of demography pointing clear cut divide between Western part, central and South-eastern part. The

foregoing discussion therefore attempts to capture the reality of spatio-temporal growth perspective in terms of size, density and consistency of growth within the time frame of 1951-2001. Present paper attempts to focus on the temporal, spatial as well as spatio-temporal block wise population growth of size and density of population. Thereby the following objectives are taken into consideration: Index of size growth of population of the district over the time period under consideration, Index of density growth of population of the district.

**Demographic and Socio-economic Perspective of Bankura, 2011**

Total Population: 3596674 (4.49% of state)
Density of Population : 523 per sq km ( State figure 1028)
No. of Blocks: 22; No. of Subdivisions: 3;
Male: 51.11% , Female: 48.89%
Rural pop: 91.67% ( State 68.13%)
Urban: 8.33% ( State 31.82).
sex ratio: 957 ( State 950)
Literacy rate:   70.26 % ( State 77.08%)
Male lit.-80.05% ( S 81.69), female lit.-60.05 (State 70.54)
SC pop: 33.53%, ST pop: 10.25%
Net sown area: 5355 sq. km
Forest Area: 1463.56 sq. km.( 21.27 %) (State 13.68 %)
Agricultural workers ( 957097; 26.61 %)
Industrial workers ( 61386 ;1.71%
Other workers ( 447937; 12.45%)
Non-workers ( 2130454, 59.23%)

## 5.2 Population Growth and Index of Decadal Size Growth

In perceiving population growth, size, density growth of population of the district as a whole and the blocks thereafter is analyzed to perceived dimensions of temporal growth as well as spatial pattern of growth. Size growth indicates the growth of absolute population over space in reference to time as well as an administrative unit, while density growth includes population per square kilometer over time and space. Size growth of the population of the district starting from 1951 to 2011is depicted in terms of index of growth at first and percentage of decadal growth at the $2^{nd}$ phase (Fig.5.1a). Considering 1951 as a base year, the decadal population of the district is represented in respect of 1951 population. Here 1961,1971 and 2001 as

showing almost same pace of index of growth with a variation of 2-5% only .On the other hand, 1981 and 2011have registered higher differences from the preceding years (34.06% and 47.15% respectively). Interestingly, 1991 is showing the lowest index growth in comparison to previous decade with the amount of only 15.4%. The huge growth of population of 2011 in comparison to 2001 is an indication of relatively higher increase of population in future.

**Table. 5.1** Decadal Size Growth Rate and Index of Size Growth of the District

| Year | Population | Index Size Growth | Difference From Preceding Decade | Decadal Growth Rate (in %) |
|------|-----------|-------------------|----------------------------------|----------------------------|
| 1951 | 1319259 | 100% | - | - |
| 1961 | 1664513 | 126.17% | 26.17 | 26.17 |
| 1971 | 2031039 | 153.95% | 27.78 | 22.02 |
| 1981 | 2374815 | 188.01% | 34.06 | 16.93 |
| 1991 | 2683468 | 203.41% | 15.4 | 12.99 |
| 2001 | 2974613 | 225.48% | 22.07 | 10.83 |
| 2011 | 3596674 | 272.63% | 47.15 | 20.91 |

Source: Computed from Census data
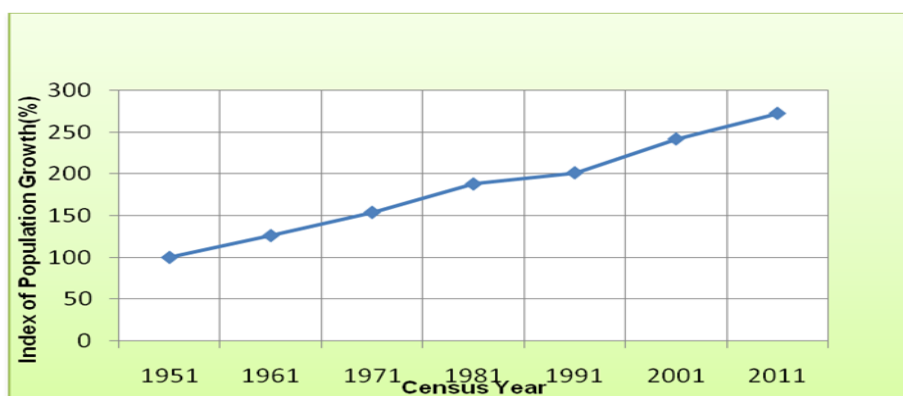


**Fig. 5.1** Index of Size growth of Population in Bankura District

## 5.3 Index of Density Growth of the District

Density growth of the population is certainly a more reflective measure than the size growth as it considers growth per unit area. In terms of size growth blocks with larger area coverage normally respond in a different tune than that of the blocks with lower area coverage. So it's become really difficult to make a comparison among the blocks of different sizes. Considering this perspective, density growth dynamics of the district is examined to focus on the nature of population growth on a uniform platform (unit area). Decadal density growth of Bankura District over the same

period of time span of investigation is represented through the index of density growth to perceive the differential growth of density over the decades (Fig. 5. 2).

**Table. 5.2** Decadal Density Growth Rate and Index of Density Growth of the District

| Year | Density | Index of Density Growth | Difference From Preceding Decade | Decadal Density Growth (in %) |
|------|---------|-------------------------|----------------------------------|-------------------------------|
| 1951 | 192 | 100% | - | - |
| 1961 | 243 | 126.56% | 26.56 | 26.56 |
| 1971 | 295 | 153.65% | 27.09 | 21.4 |
| 1981 | 345 | 179.69% | 26.04 | 14.49 |
| 1991 | 390 | 203.13% | 23.44 | 13.04 |
| 2001 | 432 | 225% | 21.87 | 10.77 |
| 2011 | 532 | 272.40% | 47.4 | 21.06 |

Source: Calculated from Census data
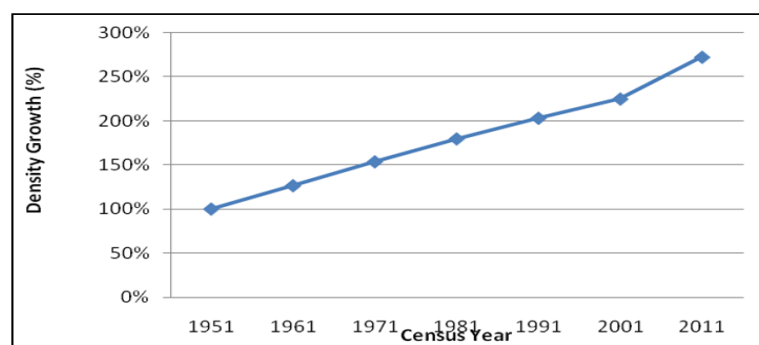


**Fig. 5.2** Index of Density Growth (%) of Population in Bankura District

In terms of density, Kings and Jerks are observed with higher index of density growth in 2011 while low index of growth in 1991 and 2001. Apart from these three decades, other four decades have registered almost homogeneous index of growth very close to 26%. Index of growth of density was homogeneous up to 1981 and has declined thereafter in both 1991 and 2001 and thereafter a sharp rise in 2011. So both in the index of size growth and density growth the last census enumeration are showing an alarming growth of population within the district that critically assumes higher growth of population in future.

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## Chapter – 6 : Composition of Population

- Aspect of Composition of Population

- Trend of Sex Ratio

- Caste Composition

# Composition of Population

Population composition at a macro or micro scale covers a lot of aspects. It includes age, sex, literacy, occupation, language, religion, caste, sex ratio etc. Different types of composition, apart from demographic dynamics have profound impact socio-cultural aspect, economic perspective, functional aspect of resource development, labor skill etc. But for the demographic analysis of a district, all the parameters are not important. At the same time in Indian context of census operation, all the data are not always available for a district. Considering this reality, present analysis has been carried out on the basis of rural-urban composition, caste structure, literacy, occupation and sex ratio. Age-sex structure has been avoided as at a block level analysis. Age-sex structure is not so much reflexive and at the same time census enumeration has considered different level age structure. More often incidence of error is common in age statistics for the developing country with high illiteracy (Smith, 1960).

## 6.1 Aspect of Composition of Population

Research in population geography or demography becomes incomplete unless and until it is associated with composition of population, because composition of population reflects the inner dynamics of demography, in this enquiry, only few segments of population composition are discussed under the head of sex and caste composition are discussed with a synoptic outline of ten of sex ratio. The district is overwhelmed with rural population over the entire period of investigation. Thereby rural- urban composition is not at all dynamics over the entire period of investigation. Age-sex pyramid has experienced a little change over sixty years. Literacy and health are not widely discussed as these two factors are included in analyzing socio-economic development. Religious composition is available only in1951. For such reasons composition of population are revealed through trend of sex-ratio, sex composition only.

## 6.2 Trend of Sex Ratio

At the initial period of enquiry (1951) the sex ratio was appreciably high for some blocks. For western blocks like Chhatna, Ranibandh, and for the blocks with moderate concentration of forest and tribes are showing sex ratio (male/female) more than thousand (Appendix-III ). It is also found for Sonamukhi and Patrasayer in 1961. But like the common scenario of India and West Bengal (Chandna, R.C., 2013), there is almost a continuous decline in sex ratio under the period of investigation (Table: 6.1) for such an underdeveloped block where tribal concentration is more than national average (Census of India, 2011). This certainly confirms the deep belief of a particular developing nation where performance of male child is found across the different layers of the society irrespective of caste, creed and religion.

**Table: 6.1** Threshold and Change of Decadal Sex Ratio (1951 – 2011)

| Blocks | a | b | t value | Blocks | a | b | t value |
|--------|-----|-------|---------|--------|------|-------|---------|
| Bankura | 948 | 0.14 | | Raipur | 977 | -3.07 | |
| Onda | 989 | -5.25 | | Simlapal | 946 | 1.07 | |
| Chhatna | 997 | -5.32 | | Taldangra | 976 | -2.14 | |
| Gangajalhati | 1009 | -10.57 | Statistically Significance At 95% level | Bishnupur | 1010 | -8.25 | Statistically Significance At 95% level |
| Barjora | 999 | -9.43 | | Joypur | 1019 | -9.82 | |
| Mejia | 967 | -6.07 | | Kotulpur | 982 | -4.6 | |
| Saltora | 997 | -8.04 | | Sonamukhi | 966 | -2.18 | |
| Khatra | 972 | -4.36 | | Patrasayer | 993 | -3.75 | |
| Indpur | 974 | -5.93 | | Indus | 996 | -6.64 | |
| Ranibandh | 976 | -2.64 | | Dist.bankura | 983 | -4.96 | |

**Source**: Computed from Census Data (1951 – 2011)

It must be mentioned here that 2011 census has enumerated a different picture as out of nineteen blocks only four blocks (Chhatna, Gangajalghati, Saltora and Sonamukhi) have enrolled in the decline of sex ratio (Fig: 6.1a & b) while others are showing increase in sex ratio. This is not a sporadic change. Rather it is found in the 2001 census also where out of nineteen blocks, ten are showing increase in sex ratio to that of the previous decade. So the new millennium is upgrading hope towards a balance sex ratio perhaps due to shift of economy from subsistence to commercial where son-fixation is being ruled out with the progress of rapid urbanization after new economic reforms.
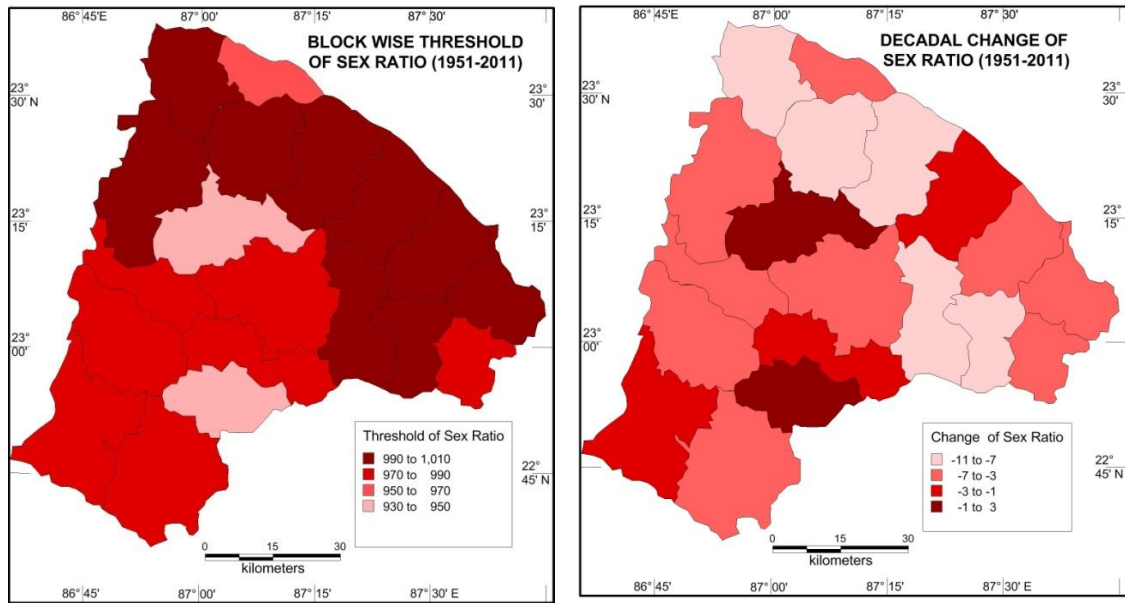
**Fig: 6.1a & b** Threshold and Change of Decadal Sex Ratio (1951 – 2011)

### 6.2.1 Sex Composition

It is almost true that sex ratio of developing country like India shows a depressive scenario but in terms of percentage of male and female either in block level or country level it is almost balance (Clark, j., 1990). For the study area of Bankura district or at the block level, the percentage of male and female are almost balanced. For most of the blocks, male percentage has rarely crossed more than 51 percent through the period of investigation (1951-2011) and so it is rarely low below 49 percent. Therefore percentage analysis of sex composition is monotonous in this context. For such constraints absolute male and female population over the period of 60 years has been treated through time series analysis (Appendix-V & VI). Percentage growth of male and female population is almost the same throughout the period of investigation. Therefore absolute growth of male and female population have been ascribed through regression analysis setting linear regression in the form of **Y=a+bx**

Where, **a** is the threshold and **b** is the decadal absolute growth of male or female population and x is the subsequent decade. Linear regression is preferred here as for most of the blocks the trend is linear. The threshold indicates absolute male or female population (Appendix-VI) at the base year (1951) of the respective blocks and **b** is the rate of change of absolute male or female population per decade of the respective blocks.

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**6.2.2 Threshold and Change of Decadal Male Population (1951 – 2011)**

With this assumption (Table: 6.2) show the threshold of male and female population respectively at the base year (1951). For male population Bankura and Raipur are standing apart with highest threshold within the range of 347800 to 49800. Next category (27400-34800) is occupied by Khatra and Chhatna. Block of the plain plateau-transition (Kotulpur, Indus, Joypur, Patrasayer, Taldangra and Simlapal) are showing lowest population threshold (12600-20000). Other blocks have responded in the range from 20000-27400 (Fig: 6.2a). Therefore Bankura, Raipur, Khatra and Chhatna have started the threshold of male population in the year 1951 with relatively higher values.

**Table: 6.2** Decadal Threshold and Change of Male Population (1951 – 2011)

| Blocks | a | b | r | Blocks | a | b | r |
|---|---|---|---|---|---|---|---|
| Bankura | 49732 | 212395 | 0.999 | Raipur | 37914 | 14616 | 0.997 |
| Onda | 95901 | 14468 | 0.998 | Simlapal | 15627 | 8171 | 0.998 |
| Chhatna | 34005 | 6996 | 0.996 | Taldangra | 15116 | 8394 | 0.997 |
| Gangajalhati | 25489 | 9633 | 0.999 | Bishnupur | 22448 | 13022 | 0.997 |
| Barjora | 21419 | 12284 | 0.997 | Joypur | 16705 | 9093 | 0.999 |
| Mejia | 12616 | 4570 | 0.998 | Kotulpur | 16003 | 11559 | 0.999 |
| Saltora | 22568 | 6697 | 0.999 | Sonamukhi | 20170 | 11004 | 0.998 |
| Khatra | 29847 | 10269 | 0.99 | Patrasayer | 19593 | 11112 | 0.999 |
| Indpur | 22463 | 8184 | 0.996 | Indus | 16592 | 10183 | 0.998 |
| Ranibandh | 23592 | 5040 | 0.995 | Dist.Bankura | 466795 | 188742 | 0.995 |

**Source:** Computed from Census Data (1951 – 2011)

Change of decadal female population (**b** value) is more important in real scenario as so called developed blocks pronounced with lucrative agriculture, urbanization and industrialization are showing higher rate of change of male population (above 10,000) except Raipur and Khatra. These blocks are Bankura, Barjora, Bishnupur, Kotulpur, Indus, Sonamukhi, Patrasayer and Onda. Western blocks and blocks of lateritic tract are showing relatively low (below 10,000) value indicating relatively slow growth of male population (Fig: 6.2b).
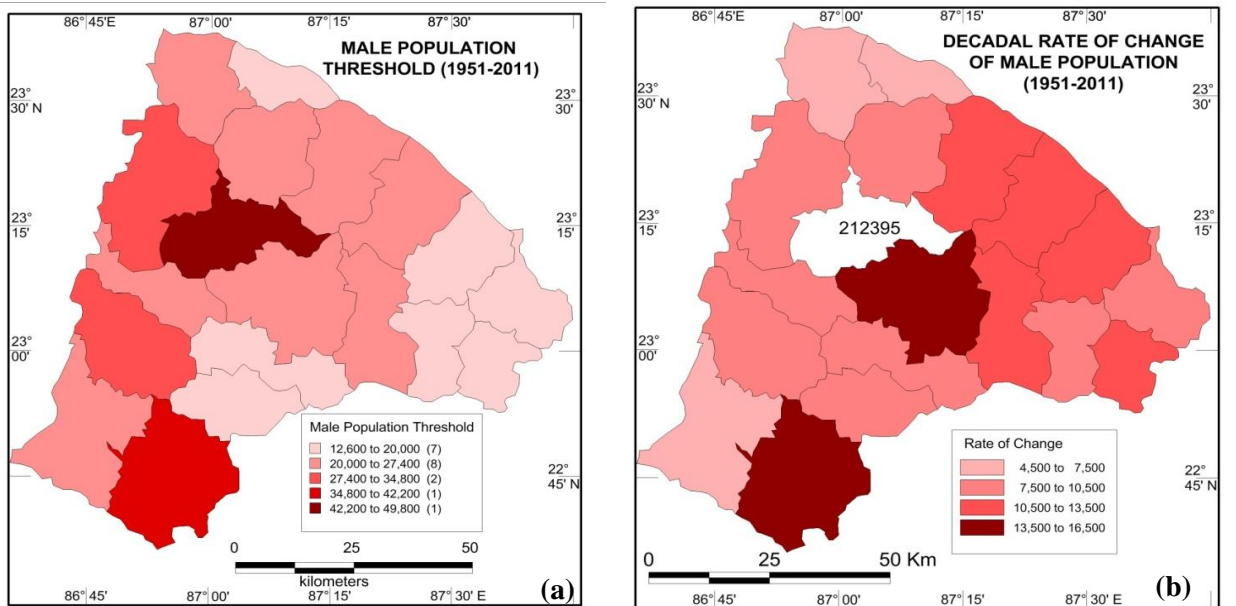
**Fig: 6.2a & b** Threshold and Change of Decadal Male Population (1951 – 2011)

## 6.2.3 Threshold and Change of Decadal Female Population (1951- 2011)

For female threshold population Chhatna and Raipur are showing very high value like male threshold population within the range of (33000-40000), though Bankura block has out competed all other blocks with a very high value (47837) and therefore is indicated separately at the base year 1951. Almost in the way like male population threshold (Table: 6.3) of Onda and Khatra are enrolled in the second category (26000-33000), along with Gangajalghati. Other southern, central and south-eastern blocks like male population threshold are showing low response (Fig: 6.3a).

**Table: 6.3** Decadal Threshold and Change of Female Population (1951 – 2011)

| Blocks | a | b | r | Blocks | a | b | r |
|--------|---|---|---|--------|---|---|---|
| Bankura | 478317 | 19998 | 0.999 | Raipur | 37283 | 13878 | 0.996 |
| Onda | 26449 | 13578 | 0.998 | Simlapal | 14502 | 7861 | 0.997 |
| Chhatna | 34536 | 8402 | 0.996 | Taldangra | 14815 | 8061 | 0.996 |
| Gangajalhati | 26849 | 8662 | 0.999 | Bishnupur | 23390 | 12253 | 0.996 |
| Barjora | 22531 | 11214 | 0.995 | Joypur | 17966 | 8412 | 0.999 |
| Mejia | 12480 | 4134 | 0.998 | Kotulpur | 16536 | 10814 | 0.999 |
| Saltora | 12902 | 9846 | 0.891 | Sonamukhi | 20228 | 10279 | 0.999 |
| Khatra | 29341 | 9546 | 0.987 | Patrasayer | 20005 | 9957 | 0.998 |
| Indpur | 22278 | 7499 | 0.997 | Indus | 17259 | 9501 | 0.999 |
| Ranibandh | 22951 | 4810 | 0.991 | Dist.Bankura | 467419 | 176489 | 0.994 |

Source: Computed from Census Data (1951 – 2011)
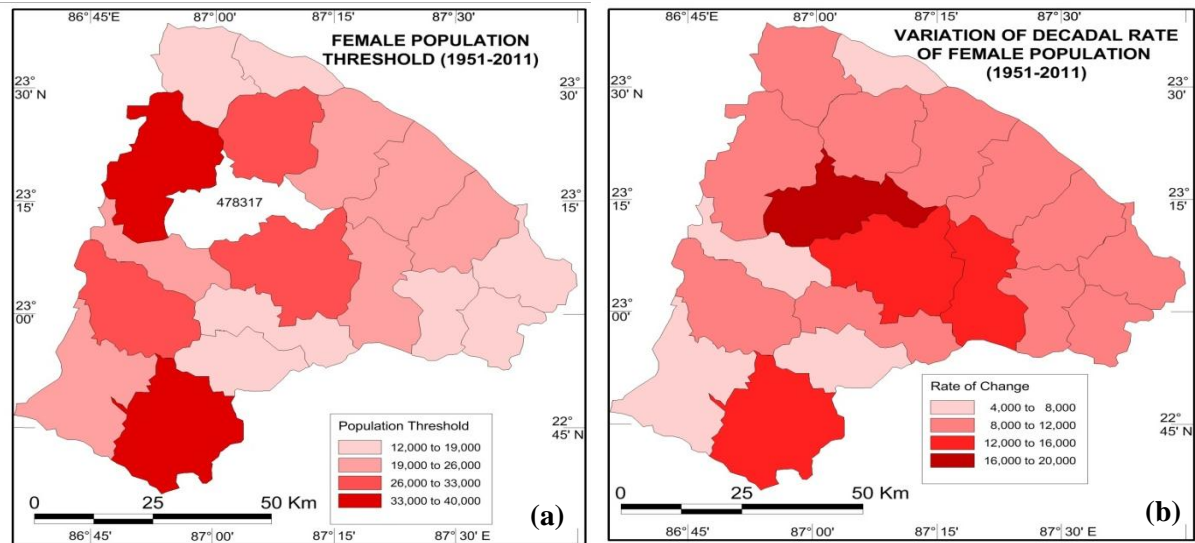
Fig: 6.3a & b Threshold and Change of Decadal Female Population (1951 – 2011)

**Table: 6.4** Percentage variation of ST and SC Population (1961- 2011)

| Blocks | 1961 | | 1971 | | 1981 | | 1991 | | 2001 | | 2011 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ST | SC | ST | SC | ST | SC | ST | SC | ST | SC | ST | SC |
| Bankura | 2.75 | 28.72 | 2.84 | 26.7 | 2.89 | 28.11 | 2.5 | 20.37 | 3.13 | 28.82 | 2.89 | 29.12 |
| Onda | 5.26 | 33.11 | 4.78 | 29.44 | 4.52 | 30.66 | 4.56 | 32.7 | 4.78 | 32.47 | 4.52 | 33.18 |
| Chhatna | 22.38 | 25.72 | 21.91 | 26.3 | 22.54 | 25.49 | 22.13 | 27.53 | 21.82 | 27.38 | 20.5 | 23.75 |
| Gangajalhati | 4.22 | 34.12 | 3.39 | 33.23 | 3.49 | 32.88 | 3.85 | 33.99 | 4.06 | 33.65 | 3.96 | 35.27 |
| Barjora | 1.54 | 28.73 | 1.18 | 29.29 | 1.44 | 29.68 | 1.71 | 31.93 | 1.8 | 32.47 | 1.16 | 35.56 |
| Mejia | 1.35 | 33.29 | 1.78 | 30.06 | 1.72 | 30.84 | 2.45 | 33.03 | 2.21 | 32.88 | 2.45 | 34.76 |
| Saltora | 19.59 | 31.38 | 18.71 | 29.45 | 18.44 | 31.51 | 18.21 | 33.24 | 19.01 | 33.61 | 18.9 | 34.19 |
| Khatra | 23.18 | 25.67 | 22.35 | 28.44 | 25.05 | 23.65 | 25.35 | 25.67 | 24.85 | 24.66 | 24.77 | 27.83 |
| Indpur | 7 | 38.77 | 9.55 | 34.16 | 9.49 | 37.12 | 9.28 | 39.23 | 9.8 | 38.17 | 9.59 | 40.59 |
| Ranibandh | 41.41 | 13.41 | 45.86 | 14.57 | 49.23 | 10.85 | 47.82 | 11.3 | 47.28 | 11.24 | 47.07 | 11.45 |
| Raipur | 25.1 | 21.15 | 24.77 | 21.75 | 27.21 | 21.7 | 25.18 | 23.45 | 25.14 | 23.46 | 24.37 | 24.68 |
| Simlapal | 14.46 | 23.46 | 13.92 | 25.37 | 14.77 | 22.5 | 15.54 | 24.96 | 14.82 | 24.98 | 14.88 | 26.38 |
| Taldangra | 14.27 | 25.89 | 13.69 | 25.37 | 13.95 | 22.65 | 13.99 | 24.55 | 13.86 | 23.73 | 13.93 | 26.3 |
| Bishnupur | 5.15 | 30.94 | 5.43 | 27.88 | 5.05 | 26.21 | 4.81 | 21.8 | 5.47 | 29.3 | 5.53 | 31.5 |
| Joypur | 1.76 | 32.84 | 1.66 | 26.59 | 1.71 | 31.53 | 1.74 | 37.04 | 2.19 | 37.58 | 2.05 | 38.88 |
| Kotulpur | 2.45 | 28.2 | 2.45 | 27.33 | 2.68 | 29.63 | 2.94 | 34.04 | 3.31 | 34.38 | 3.32 | 36.54 |
| Sonamukhi | 3.74 | 34.16 | 2.5 | 31.99 | 2.75 | 37.17 | 2.68 | 34.87 | 3.2 | 39 | 3.2 | 40.68 |
| Patrasayer | 2.31 | 40.51 | 2.42 | 39.22 | 2.54 | 38.56 | 2.7 | 44.53 | 2.96 | 44.7 | 3.01 | 46.45 |
| Indus | 1.6 | 37.48 | 1.7 | 36.97 | 1.42 | 39.01 | 1.85 | 44.33 | 1.9 | 41.77 | 1.85 | 43.75 |

**Source:** Computed from Census (1961 – 2011)
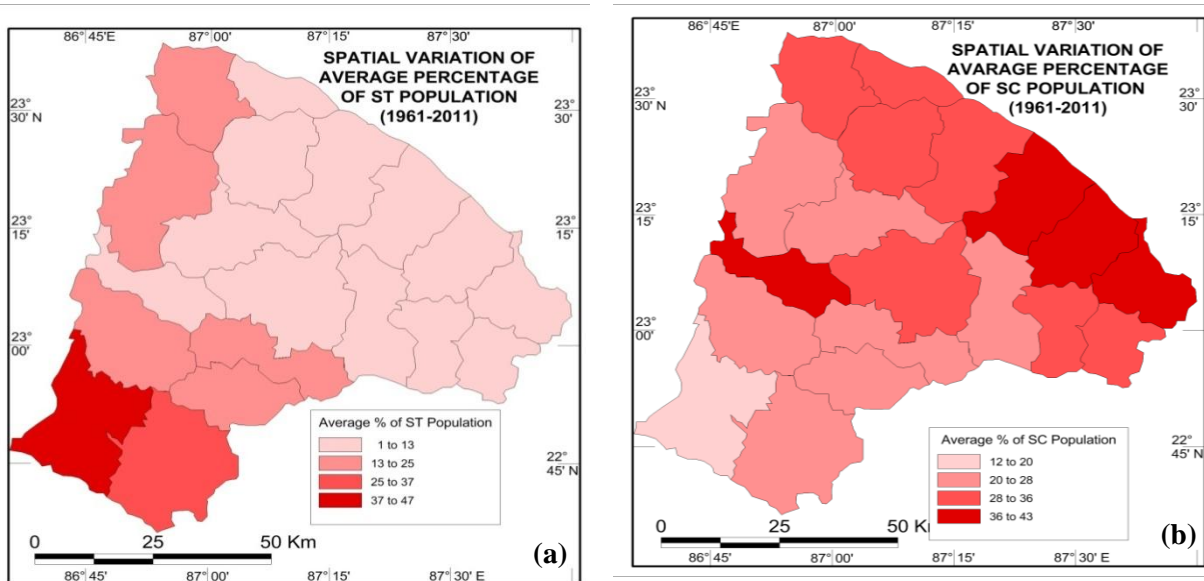
**Fig: 6.4a & b** Average Decadal ST and SC Population in Percentage (1961 – 2011)

Change of decadal female population with the help of regression analysis shows almost the same picture as it was found in change of decadal male population. Here also the rate is higher for Bankura (19998 /decade). Others blocks showing relatively higher value (above 10,000) are Onda, Barjora, Bishnupur, Katulpur, Sonamukhi and Patrasayer. Here also underdeveloped blocks like Raipur and Khatra are showing higher value. Western blocks and Simlipal, Taldangra, Indus and Joypur are showing low decadal change of female population (below 10,000). In both the cases Raipur and Khatra being the underdeveloped blocks are showing higher threshold as well as change of decadal male and female population which is certainly alarming in terms of total population (Fig: 6.3b).

## 6.3 Caste Composition

Bishnupur are overwhelmed with rural population. But more alarming is the steady decline of sex-ratio of all the blocks which is not an exceptional scenario, but the general picture of West Bengal and India. In terms of percentage of Caste composition (Appendix-VIII & IX), all the three categories of population over the blocks remain almost same throughout the period of observation. But scheduled tribe concentration is high in the western block and relatively low concentration of scheduled caste population. Ranibandh, Raipur, Khatra, Chhatna and Saltora have very high concentration of scheduled tribe population over 20 percentage (Saltora is very close to 20 percentage). Scheduled caste

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population is spread out throughout the blocks within the range of 20 to 40 percent with exception of Ranibandh.

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## Chapter – 7 : Aspects of Decadal Size and Density Growth of Population

- Decadal Growth Rate of Population Size and Density of the District

- Decadal Population Size Growth Rate of the Blocks

- Decadal Population Growth Rates of the Blocks

- Threshold and Rate of Decadal Size Growth

- Threshold and Rate of Density Growth

- Consistency and Inconsistency of Size Growth

- Consistency and Inconsistency of Density Growth

# *Aspects of Size and Density Growth of Population*

Population growth of the Bankura district is appreciably low compared with other districts of south Bengal except Purulia and Birbhum. This is due to low resource potential constrained by topography, climate and soil (Dasgupta, A. 2010). Therefore growth of population after independence was slow that picked up from 1981. These general scenarios strongly differ at block level. Therefore, aspects of growth of decadal population in terms of size and density over time and space have been assessed considering block as the lowest unit. The following sections therefore, outline the threshold of growth rate and change of growth rate and variability within the period of investigation.

## 7.1 Decadal Growth Rate of Population Size and Density of the District

While index of population growth is the reflection of growth in terms of base year, decadal growth prompts the perspective of nature of growth in relation to preceding point (Guchhait, S. K. 2005). So logically; comparative assessment is more articulated in the decadal growth of size and density.

District Bankura presents parity between decadal size and density growth rate of population. It is only found for Bankura, but perhaps the inherent tune of population growth dynamics of an area, because population size is related to the area. But the area is fixed over time. So density growth rate and size growth rate will not differ each other as the area is fixed.

Decadal growth rate of population size and density were 26.17 percent and 26.56 percent respectively in the year of 1961. A gradual decline has been observed thereafter up to 2001(Table 7.1) with a difference of 3 to 5 percent decrease in the next decade (Fig. 7.1). But like the index of growth of population, the decadal growth rate of population size and density has once again picked up to 20.91 percent in 2011, almost double to that of the preceding decade, promoting sharp growth of both population size and density, indicating beginning of explosive situation if it is continued in future.

**Table. 7.1** Decadal Growth Rate of Population of Bankura and West Bengal (1951-2011)

| Census Years | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Decadal Growth Rate (%) Bankura | 2.3 | 26.17 | 22.02 | 16.93 | 12.99 | 10.83 | 20.91 |
| Decadal Growth Rate (%) West Bengal | 13.22 | 32.8 | 26.87 | 23.17 | 24.55 | 17.77 | 13.84 |
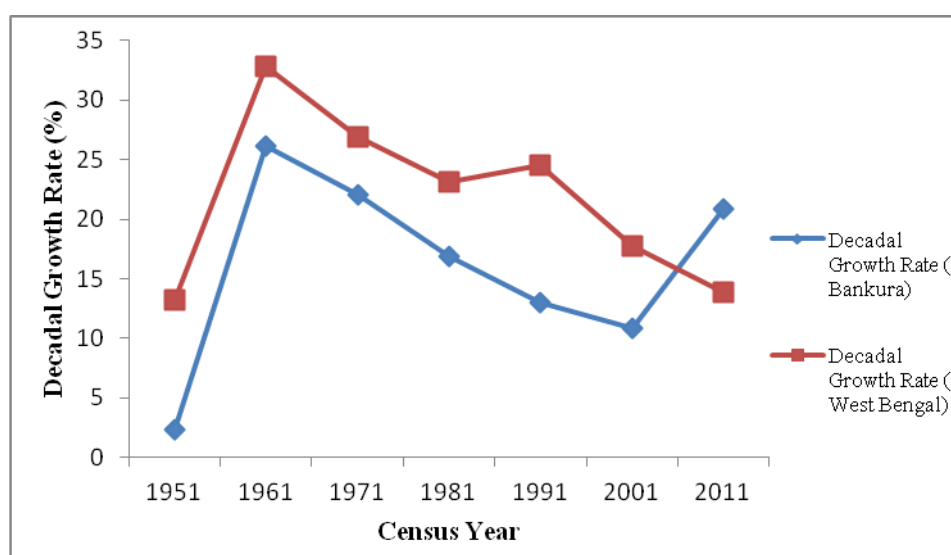


**Fig. 7.1** Population Growth Rate of Bankura and West Bengal (1951-2011)

## 7.2 Decadal Population Size Growth Rate of the Blocks

Decadal size growth rate of the district was the overall scenario. But block wise decadal size growth rate will certainly be different from that the district growth rate due to variability of physical and cultural landscape as well as resource potential that are certainly responsible for growth of population in an area (Demco, J. et al., 1970). Block wise decadal growth rate is now analyzed in a systematic framework estimating the decadal size growth of the blocks from 1961 to 2011, with the help of linear regression equation, **Yc=a+bx**, where '**a'** is the threshold of decadal size growth rate, '**b'** is the of change of decadal size growth rate, x is the time period and **Yc** is the computed size growth in a census year (Table 7.2). Such a time series regression over a span of five decades shows the general trend of decadal size growth of the blocks in terms of threshold of decadal growth rate of size and rate of change of decadal growth rate.

**Table. 7.2** Decadal Size Growth Rate (in %)

| Blocks | 1951-61 | 1961-71 | 1971-81 | 1981-91 | 1991-2001 | 2001-11 | a | b |
|--------|---------|---------|---------|---------|-----------|---------|------|------|
| Bankura | 24.6 | 24.59 | 17.17 | 18.77 | 13.57 | 10.89 | 28.27 | -2.86 |
| Onda | 29.57 | 19.69 | 22.26 | 18.8 | 15.44 | 14.69 | 29.14 | -2.59 |
| Chhatna | 14.92 | 17.08 | 12.42 | 15.75 | 8.37 | 15.26 | 16.08 | -0.6 |
| G. Ghati | 26.19 | 19.82 | 16.57 | 15.05 | 12.82 | 11.71 | 26.52 | -2.71 |
| Barjora | 31.48 | 24.33 | 18.88 | 17.21 | 12.54 | 12.87 | 32.56 | -3.72 |
| Mejia | 22.78 | 20.73 | 21.63 | 12.81 | 9.86 | 13.22 | 25.76 | -2.55 |
| Saltora | 19.28 | 18.85 | 12.68 | 17.1 | 9.58 | 11.87 | 20.94 | -1.73 |
| Khatra | 20.84 | 14.79 | 13.36 | 14.77 | 15.46 | 14.73 | 18.37 | -0.78 |
| Indpur | 19.38 | 21.36 | 12.9 | 21.27 | 10.17 | 13.57 | 21.87 | -1.55 |
| Ranibandh | 15.13 | 15.75 | 7.55 | 13.07 | 11.28 | 14.15 | 14.1 | -0.37 |
| Raipur | 14.66 | 29.21 | 13.23 | 16.96 | 14.15 | 12.89 | 21.88 | -1.44 |
| Simlapal | 22.49 | 23.11 | 22.86 | 20.68 | 14.5 | 12.24 | 27.24 | -2.26 |
| Taldangra | 21.27 | 24.68 | 21.41 | 19.81 | 15.39 | 14.87 | 25.72 | -1.76 |
| Bishnupur | 37.3 | 13.81 | 22.94 | 21.01 | 17.09 | 11.9 | 32.58 | -3.4 |
| Joypur | 35.56 | 22.03 | 18.27 | 19.18 | 15.9 | 10.9 | 34.38 | -4.02 |
| Kotulpur | 43.38 | 28.81 | 20.14 | 19.79 | 15.93 | 12.67 | 42.71 | -5.5 |
| Sonamukhi | 34.77 | 28.16 | 16.31 | 20.42 | 14.41 | 10.67 | 36.55 | -4.5 |
| Patrasayer | 36.85 | 19.29 | 16.36 | 21.46 | 16.69 | 12.2 | 33.07 | -3.6 |
| Indus | 43.3 | 30.96 | 17.25 | 9.54 | 23.92 | 11.08 | 41.67 | -5.43 |

Source: Computed from Census Data

Looking at the threshold (a) of table 7.2, all the nineteen blocks can be segregated into five categories, these are blocks with threshold of more than 35% (Indus, Sonamukhi, Kotulpur), within 30-35% (Barjora, Bishnupur, Joypur, Patrasayer), within 25-30% (Bankura, Onda, Gangajolhati, Mejia, Simlapal, Taldangra), within 20-25% (Saltora, Indpur, Raipur) and below 20% (Chhatna, Khatra, Ranibandh). In the temporal trend of growth rate of decadal size, all the blocks are showing decline trend in general with a deviation in 1991 and 2011 (Appendix-I), where several blocks have registered increased in rate. In terms of rate of change of size growth rate (b) all the blocks are loaded with negative values, ranging from 0.6 to 5.43% (Fig. 7.2b). Therefore, the threshold are highly variable while rate of change are more homogeneous as twelve blocks are showing high negative rate (more than 2.5%), while seven blocks are depicting lower negative growth rate (less than 2.5%). Out of nineteen blocks, only three blocks are

showing almost uniform rate of decadal growth of population size (Chatna, Khatra and Ranibandh) as the rate of decrease of decadal size growth is less than 1%.
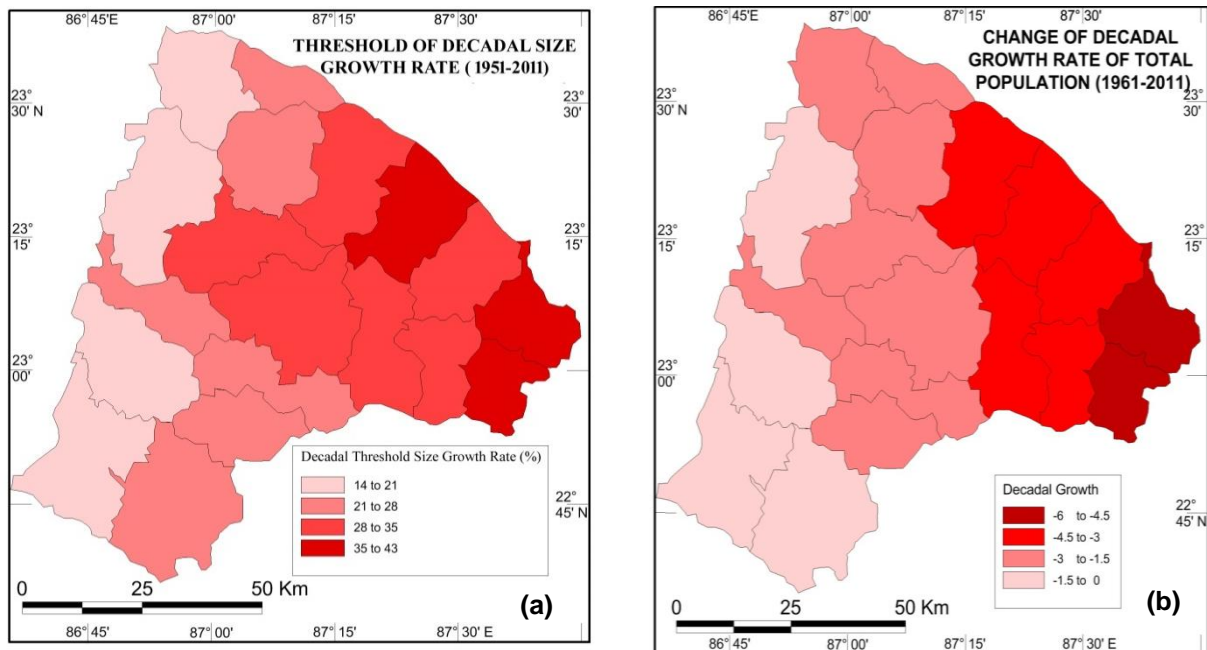


**Fig. 7.2 (a)** Block wise Decadal size Growth Rate, (**b**) Change of Decadal Growth Rate
.

## 7.3. Decadal Population Growth Rates of the Blocks

Decadal growth of population is reflecting a different scenario with continuous decrease of decadal growth (Table 7.2). In the 1961 and 1971, decadal growth rate was above 20% (26.17% in 1961 and 22.02% in 1971). The population of the District in 1981, 1991, 2001 has experienced a continuous low level of growth rate. Such a continuous decrease rate of population size growth is an indication towards the stabilization of population.

Size growths of the blocks are examined within a span of 20 years (1961-1981-2001) to perceive the pace of size growth (Table 7.2). At the initial point (1961) blocks are showing differential rate of decadal size growth. It can easily be segregated into 5 tires with blocks more than 35%, within 30-35% ,within 25-30%, within 20-25% and below 20%.Indus, Kotulpur, Bishnupur, Patrasayer and Joypur are showing very high rate of decadal size growth with more than 35%.In the next category (30-35%), Sonamukhi, Barjora, Onda are included whereas Gangajalghati, Bankura, Mejia, Simlapal, Taldangra and Khatra have registered decadal size growth in the range of 20-25%, decadal size growth

less than 20% is observed for Indpur, Saltora, Ranibandh, Raipur and Chhatna. Such a diversified growth rates have got homogeneity in 1981 with highest value of 22.94% and the lowest value of 12.42% neglecting very low value of Ranibandh (Fig. 7.2a). In this census remuneration all the blocks are showing decreased amount of decadal growth rate expect Simlapal and Taldangra.

A further decrease of decadal growth rate is found in 2011 census with the exception of Indus, Ranibandh and Raipur where decadal growth is higher than 1981.In 2001 all the blocks other than Indus have registered decadal growth rate less than 20% (Fig. 7.3 b). The previous census has enumerated all almost homogeneous size growth rates for all the blocks which is below 15% and above 10% for most of the blocks. Thus there is a clear indication of decreasing rate of population growth as well as uniformity of growth rate of population certainly indicates stabilization of population size.

**Table. 7.3** Threshold and Rate of Decadal Size Growth

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | a | b | r |
|--------|------|------|------|------|------|------|------|---|---|---|
| Bankura | 141850 | 176746 | 220213 | 258014 | 306454 | 348036 | 385935 | 96596 | 41467 | 0.999 |
| Onda | 84829 | 109913 | 131552 | 160838 | 191078 | 220572 | 252984 | 52351 | 28047 | 0.998 |
| Chhatna | 89182 | 102488 | 119994 | 134900 | 156147 | 169215 | 195038 | 68541 | 17399 | 0.996 |
| G. Ghati | 70817 | 89366 | 107075 | 124814 | 143595 | 162007 | 180974 | 52339 | 18295 | 0.999 |
| Barjora | 69831 | 91817 | 114154 | 135703 | 159060 | 179007 | 202049 | 47954 | 21998 | 0.999 |
| Mejia | 34068 | 41827 | 50499 | 61424 | 69294 | 76123 | 86188 | 25097 | 8705 | 0.998 |
| Saltora | 59304 | 70736 | 84073 | 94734 | 110929 | 121552 | 135980 | 45542 | 12804 | 0.999 |
| Khatra | 84020 | 101529 | 116550 | 132121 | 151630 | 175071 | 200864 | 61298 | 19025 | 0.994 |
| Indpur | 63069 | 75292 | 91374 | 103162 | 125106 | 137825 | 156522 | 44742 | 15684 | 0.997 |
| Ranibandh | 57850 | 66604 | 77094 | 82911 | 93748 | 104326 | 119089 | 46544 | 9851 | 0.998 |
| Raipur | 110028 | 126157 | 163009 | 184574 | 215870 | 246421 | 278185 | 75198 | 28495 | 0.997 |
| Simlapal | 49782 | 60978 | 75068 | 92232 | 111308 | 127445 | 143038 | 30130 | 16034 | 0.997 |
| Taldangra | 50733 | 61525 | 76709 | 93129 | 111573 | 128747 | 147893 | 31406 | 15904 | 0.997 |
| Bishnupur | 73741 | 101243 | 115224 | 141652 | 171414 | 200715 | 224605 | 45838 | 25276 | 0.996 |
| Joypur | 52359 | 70980 | 86614 | 102435 | 122082 | 141497 | 156920 | 34672 | 17507 | 0.999 |
| Kotulpur | 54374 | 77960 | 100424 | 120652 | 144528 | 167547 | 188775 | 32540 | 22374 | 0.999 |
| Sonamukhi | 61307 | 82624 | 105890 | 123156 | 148308 | 169682 | 187782 | 40399 | 21284 | 0.999 |
| Patrasayer | 60940 | 83396 | 99486 | 115758 | 140600 | 164060 | 184070 | 39497 | 20423 | 0.997 |
| Indus | 51175 | 73332 | 96037 | 112606 | 123344 | 152847 | 169783 | 33852 | 19363 | 0.995 |

Source: Computed from Census Data

## 7.4 Threshold and Rate of Decadal Size Growth

Earlier discussion basically prompts on decadal growth rate in terms of index measure and percentage analysis. Such analysis is relative one. Therefore to find out the reflection of the blocks in terms of specific growth aspect and consistency of growth time series analysis has been opted which is helpful for critical appreciation of the rate of size growth as well as threshold for almost all the blocks (Sadhukhan and Sadhukhan, 1989).

Size growth of population is so uniform that all the blocks have been registered correlation 0.99. So linear time series regression have been assigned for each block for the time series analysis with the equation of **Y=a+bx** where Y is the population and **x** is the time period. Here is the threshold population (**a**) of the beginning year and (**b**) is the rate of population per decade. Now from the table 1.3 (Appendix-II), it is clear that blocks are responding different in terms of rate of decadal size growth rate (**b**) (Table. 7.3). Blocks like Bankura, Onda, Barjora, Bishnupur, Raipur and Kotulpur are showing higher size growth rate (Fig. 7.4 b). All the blocks showing higher rate of growth can be explained by their urban status and agricultural prosperity. Bankura and Bishnupur blocks are associated with municipal town while Barjora is a census town. On the other hand, Raipur and Kotulpur are the prosperous agricultural blocks of the Bankura District. Moderately developed agricultural area like Indus, Patrasayer, Sonamukhi are showing moderate rate of size growth very close to 20,000. On the contrary, blocks of the plateau area like Indpur, Ranibandh, Taldangra, Simlapal, Joypur have registered low rate of growth of population size.

In terms of threshold, Bankura, Chhatna, Onda, Raipur, Khatra and Gangajalghati are showing higher threshold value more than 50,000 and for Bankura it is almost double (Fig. 7.4a). Those blocks are relatively larger in area coverage and thus are showing higher size of population from the very beginning of the census enumeration under study (from 1951).Due to higher size of population, the thresholds are also higher. In contrast to this, Mejia, Simlapal, Taldangra, Joypur, Kotulpur and Indus are showing relatively low threshold, below 35,000. This is due to low population size from the very beginning of the census enumeration considered here (1951). Those blocks have relatively lower area coverage less than 300 sq. kms. only

with the exception of Simlapal and Taldangra which have the area coverage more than 300 sqkms. Moderate rate of threshold within the range of 35,000-50,000 are formed for Bishnupur, Sonamukhi, Patrasayer, Indpur, Saltora and Barjora. Among them, Barjora is very close to 50,000 due to its recent time industrial growth (Fig. 7.4b). Combining the threshold and the rate of size growth blocks some blocks are showing appreciable high performance. Those are Bankura, Onda, Raipur and Bishnupur. Those four blocks have registered higher size (more than 45,000) as well as higher rate of size growth (more than 25,000). In future those blocks will certainly add population.
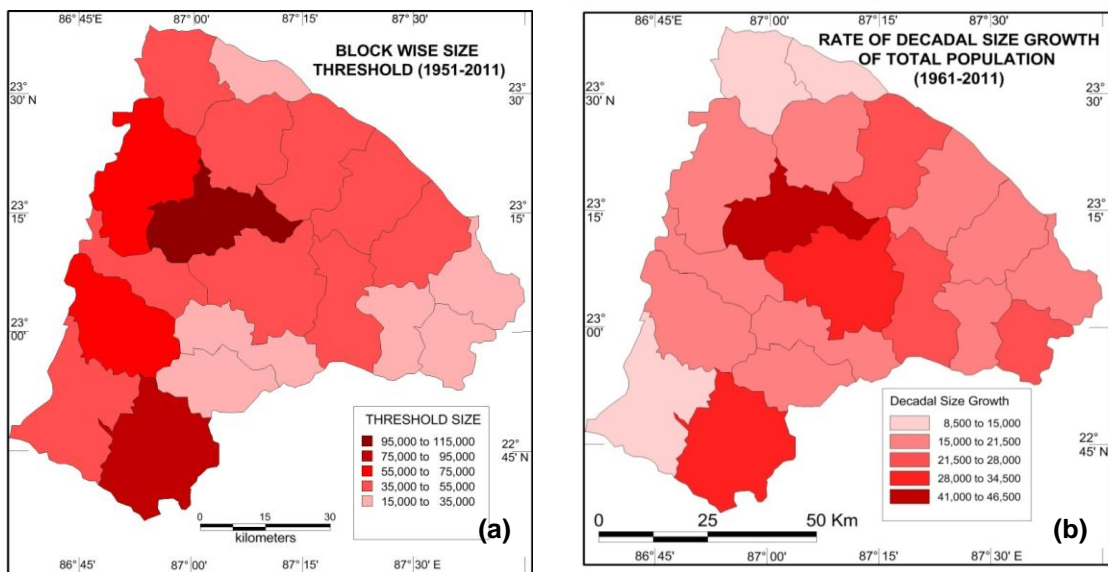


**Fig. 7.4 (a)** Threshold of population Size Growth, **(b)** Change of Decadal  Population Size Growth

## 7.5 Threshold and Rate of Density Growth

Index of density growth is a crude measure. Such analysis is relative one. To find out the reflection of the blocks in terms of specific growth aspect, time series analysis has been opted which is helpful for critical appreciation of the density growth rate as well as threshold. For almost all the blocks (Appendix-IV), density growth of population is uniform because almost all the blocks have registered correlation 0.99 with the exception of Khatra block. Therefore linear time series analysis has been assigned for each block for the time series analysis with the equation **Y=a+bx** (Yeats, 1968) where **Y** is the population density and **X** is the time period. Here '**a**' is the threshold population density of the beginning year (1951) and '**b**' is the rate of growth

of population density per decade. Now from the table 7.4 it is clear that blocks are responding differently in terms of rate of decadal population density growth (**b**). Bankura Sadar block has highest density threshold which is invariably due to urban status, employment opportunities and socio-cultural preferences. Blocks like Onda, Barjora, Mejia, Indpur, Simlapal, Bishnupur, Joypur, Kotulpur, Patrasayer and Indus are showing higher density growth over the decades. So, all these blocks showing higher density threshold (Fig. 7.5 a) can be explained by either their urban status or agricultural prosperity. On the contrary, blocks of the plateau area like Chhatna, Gangajalghati, Saltora, Khatra, Ranibandh, Raipur and Taldangra have registered low density growth rate. Developed blocks like Bankura, Onda, Barjora and Indpur are showing higher rate of change of density ( Fig. 7.5 b) , while other northern blocks like Raipur, Khatra, Saltora, Chhatna are showing low rate of density growth (below 50). Surprisingly Mejia which is silence in rate of size growth is expressing higher rate of density growth. On the other hand, southern blocks like Raipur, Taldangra, Bishnupur, Joypur, Kotulpur, Sonamukhi, Patrasayer and Indus are showing higher rate of density growth. A slightly low pace of density growth is observed foe Simlapal (47) within the southern blocks.

**Table. 7.4** Thresholds and Rate of Density Growth

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | a | b | r |
|--------|------|------|------|------|------|------|------|---|---|---|
| Bankura | 347 | 433 | 539 | 632 | 750 | 852 | 939 | 238.14 | 100.9 | 0.999 |
| Onda | 169 | 219 | 262 | 320 | 380 | 439 | 504 | 104.28 | 55.82 | 0.998 |
| Chhatna | 199 | 229 | 268 | 301 | 354 | 378 | 436 | 152.85 | 39.11 | 0.996 |
| G. Ghati | 191 | 241 | 288 | 336 | 387 | 442 | 494 | 138.42 | 50.35 | 0.999 |
| Barjora | 176 | 233 | 290 | 345 | 404 | 455 | 514 | 120.71 | 56.14 | 0.999 |
| Mejia | 209 | 257 | 310 | 377 | 425 | 467 | 529 | 154.14 | 53.39 | 0.998 |
| Saltora | 188 | 225 | 267 | 301 | 350 | 389 | 434 | 143.57 | 41.03 | 0.999 |
| Khatra | 195 | 235 | 270 | 306 | 316 | 414 | 475 | 138.14 | 44.42 | 0.973 |
| Indpur | 210 | 251 | 305 | 344 | 417 | 455 | 517 | 151.14 | 51.46 | 0.997 |
| Ranibandh | 135 | 155 | 180 | 194 | 219 | 243 | 278 | 108.57 | 23 | 0.994 |
| Raipur | 187 | 214 | 277 | 314 | 364 | 415 | 468 | 129.57 | 47.57 | 0.997 |
| Simlapal | 161 | 197 | 243 | 298 | 360 | 412 | 461 | 97.85 | 51.67 | 0.997 |
| Taldangra | 145 | 176 | 219 | 266 | 319 | 368 | 423 | 85.42 | 47.07 | 0.997 |
| Bishnupur | 194 | 267 | 304 | 373 | 414 | 529 | 579 | 124.42 | 63.89 | 0.992 |
| Joypur | 200 | 272 | 331 | 392 | 465 | 536 | 594 | 135.14 | 65.85 | 0.999 |
| Kotulpur | 217 | 311 | 401 | 482 | 577 | 669 | 755 | 129.42 | 89.5 | 0.999 |
| Sonamukhi | 161 | 217 | 279 | 324 | 390 | 447 | 480 | 110 | 54.57 | 0.997 |
| Patrasayer | 189 | 259 | 309 | 360 | 437 | 509 | 570 | 123.14 | 63.25 | 0.998 |
| Indus | 227 | 287 | 376 | 441 | 487 | 599 | 666 | 147.28 | 13.28 | 0.996 |
| Dist.bankura | 192 | 243 | 295 | 345 | 390 | 432 | 523 | 136.28 | 52.35 | 0.994 |

Source : Computed from Census Data (1951-2011)
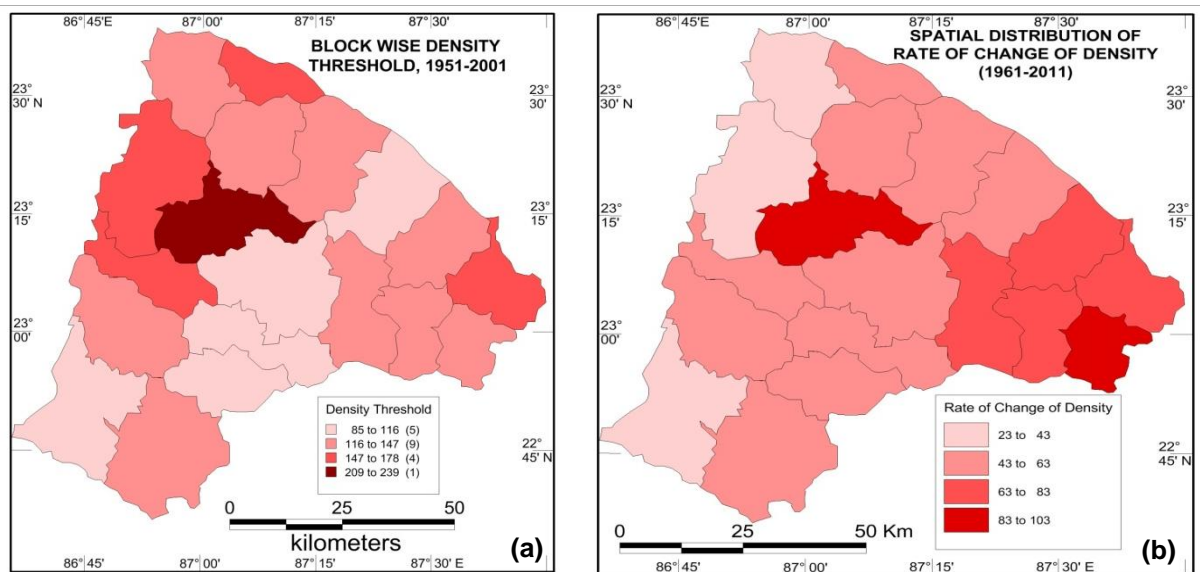
**Fig. 7.5** Block wise Density Threshold ( a) and Rate of Change of Density (b)

In terms of threshold of decadal density, Bankura block is fur above than the others (238). Among the northern blocks, Chhatna, Mejia and Indpur are showing relatively high threshold value (above 150). All these four blocks of the northern Bankura are practically showing high threshold as well as high rate of decadal density growth indicating continuous increase of population over the last 60 years that will perhaps be continued in future also. Southern blocks on the other hand, are showing low threshold but high rate of density growth. All these southern blocks apart from Taldangra have registered decadal density growth rate more than 50. So in future all these southern blocks will accumulate more population by din top these higher decadal density growth rate.

## 7.6 Consistency and Inconsistency of Size Growth

Consistency and inconsistency developed in Bankura District is reflected through C.V of the size of population within the period of 1951-2011 (Table. 7.5). In terms of the C.V all the blocks have registered relatively low C.V value pointing neither a stupendous growth nor drastic depopulation within the timeframe considered here. In such a plateau fringe block has experienced less migration or depopulation over the last 60 years.

**Table. 7.5** Spatial Distribution of Size C.V of Blocks

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | C.V. |
|---|---|---|---|---|---|---|---|---|
| Bankura | 141850 | 176746 | 220213 | 258014 | 306454 | 348036 | 385935 | |
| Onda | 84829 | 109913 | 131552 | 160838 | 191078 | 220572 | 252984 | 34.15 |
| Chhatna | 89182 | 102488 | 119994 | 134900 | 156147 | 169215 | 195038 | 25.28 |
| G. Ghati | 70817 | 89366 | 107075 | 124814 | 143595 | 162007 | 180974 | 29.15 |
| Barjora | 69831 | 91817 | 114154 | 135703 | 159060 | 179007 | 202049 | 32.37 |
| Mejia | 34068 | 41827 | 50499 | 61424 | 69294 | 76123 | 86188 | 29.09 |
| Saltora | 59304 | 70736 | 84073 | 94734 | 110929 | 121552 | 135980 | 26.49 |
| Khatra | 84020 | 101529 | 116550 | 132121 | 151630 | 175071 | 200864 | 27.84 |
| Indpur | 63069 | 75292 | 91374 | 103162 | 125106 | 137825 | 156522 | 29.26 |
| Ranibandh | 57850 | 66604 | 77094 | 82911 | 93748 | 104326 | 119089 | 23.05 |
| Raipur | 110028 | 126157 | 163009 | 184574 | 215870 | 246421 | 278185 | 30.2 |
| Simlapal | 49782 | 60978 | 75068 | 92232 | 111308 | 127445 | 143038 | 34.09 |
| Taldangra | 50733 | 61525 | 76709 | 93129 | 111573 | 128747 | 147893 | 34.47 |
| Bishnupur | 73741 | 101243 | 115224 | 141652 | 171414 | 200715 | 224605 | 34.51 |
| Joypur | 52359 | 70980 | 86614 | 102435 | 122082 | 141497 | 156920 | 33.46 |
| Kotulpur | 54374 | 77960 | 100424 | 120652 | 144528 | 167547 | 188775 | 36.67 |
| Sonamukhi | 61307 | 82624 | 105890 | 123156 | 148308 | 169682 | 187782 | 33.93 |
| Patrasayer | 60940 | 83396 | 99486 | 115758 | 140600 | 164060 | 184070 | 33.78 |
| Indus | 51175 | 73332 | 96037 | 112606 | 123344 | 152847 | 169783 | 34.93 |
| Dist.Bankura | 1319259 | 1664513 | 2031039 | 2374815 | 2683468 | 2974613 | 3596674 | |

Source : Computed from Census Data (1951-2011)
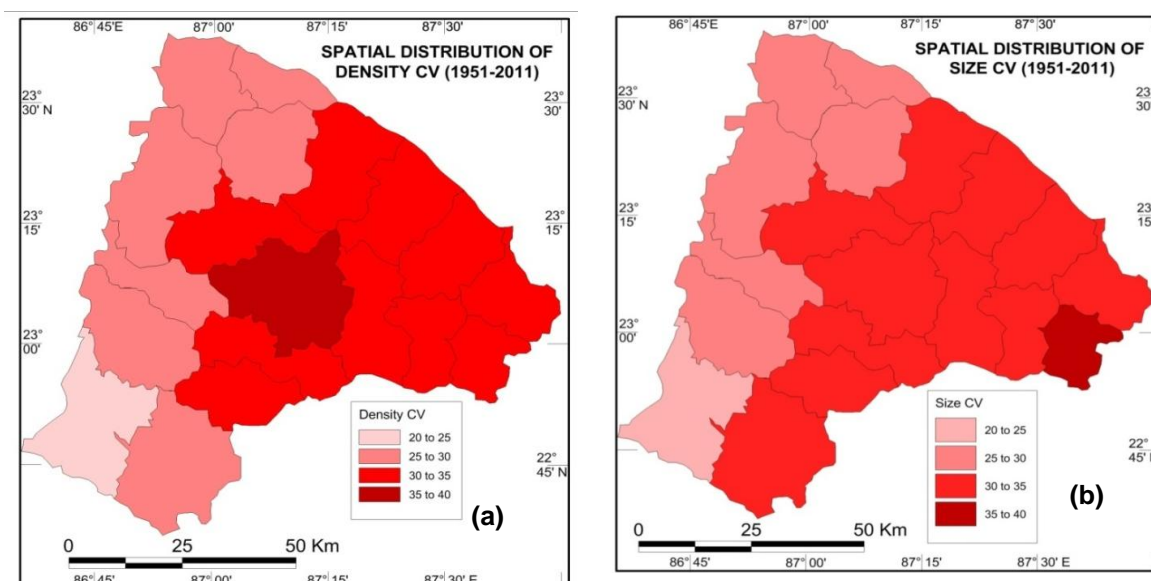


**Fig. 7.6** Inequality of Population Size (a)  and Density (b)  by C.V

But considering 30% as a demarcating line, southern blocks i.e. plateau fringe and plain area are showing relatively higher C.V (more than 30%). Among the northern blocks, Bankura, Onda and Barjora have registered higher C.V of population size (Appendix-X) because of historical growth perspective or urban dynamics. Apart from these blocks other northern blocks are showing relatively low C.V (less than 30%), these are Chhatna, Gangajalghati, Mejia, Saltora, khatra, Indpur and Ranibandh. Ranibandh have achieved lowest C.V (23%) indicating more consistency of population growth (Fig. 7.6a). This block is situated in the proper plateau area with huge tribal population which has responded consistent growth of population over the last 60 years.

## 7.7 Consistency and Inconsistency of Density Growth

Consistency and inconsistency of density growth in Bankura District is reflected through C.V of population density (Appendix-XI) within the period of 1951-2011(Guchhait, S. K. 2005). In terms of value all the blocks have registered relatively low C.V pointing moderate variation of population over space within the time frame considered here. Considering 30% as a demarcating line (density C.V of the District is 30.45%), southern blocks i.e. plateau fringe area and plain area are showing relatively higher C.V (more than 30%). Among the central blocks, Bankura, Onda and Barjora have registered higher C.V of density of population because of high population size and urban dynamics. Apart from these three blocks, other northern blocks are showing relatively low C.V (less than 30%). These are Chhatna, Gangajalghati, Mejia, Saltora, Khatra, indpur and Ranibandh. Ranibandh has achieved lowest C.V (23.06) (Fig. 7.6b). This block is situated in the proper plateau area with the highest amount of tribal concentration in the district.

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# Chapter – 8 : Spatial Aspect of Allometric Growth : A System Component Perspective

- Allometry of Size

- Allometry of Size Growth

- Allometry of Density Growth

- Population Packing: Area Population Relationship

# Spatial Aspect of Allometric Growth: A System Component Perspective

Population growth of a block is not an isolated one. It depends on physical and socio- economic factors. The welfare or human development of people of a block is guided by district administration, resource potential and functional perspective of resource utilization of a district or the block. Therefore intra district and intra block migration are the crucial factors for the population growth. But intra block level migration cannot be assessed due to limitation of data base. Therefore it is better to justify the block level population growth of size and density in respect to the district through which population growth perspective of the blocks in respect to system. This can easily be done by the system component perspective (Coffey, W, 1981), popularly known as allometric growth.

## 8.1 Allometry of Size

This chapter as a corollary of the previous one aims to address the growth of the blocks relative to that of the district. This therefore considers the adoption of the district as a system and blocks as its components, the concept of allometry discussed in chapter two, is applied here, where the relative growth of the system and its component are examined in a power regression in which the exponent is critical importance as the value of exponent of unity, less than unity and more than unity indicates isometry, negative allometry and positive allometry respectively. Isometry is the balanced growth to that of the system; negative allometry is the loosing growth in respect to system while more than isometry indicates gaining growth. The formula to analyzed allometric growth are expressed as,

$$Y = ax^b$$

Where, **b** denotes the allometric growth which is most important and **a** as the threshold is not insignificant as it controls the performance of **b**. Theoretically, if **a** is low, normally **b** becomes high and **a** is high, **b** becomes low under normal growth process. But high value of both **a** and **b** indicates hyper-normal growth and reversely low values of both **a** and **b** entails hypo-normal growth (Guchhait, S. K, 2005).

## 8.2 Allometry of Size Growth

Population size of an area may be a block or of district is related to area coverage and density. But in an allometric growth neither the area nor the density is the factor, rather decadal growth perspective of the blocks in respect to district is the point of concern. Population size allometry considers that which blocks are adding less population in respect of growth of population size of the district over time. Here 1951 is considers as the base year and 2011 is the end point (Appendix-XII). Putting the population size of the blocks as the components and district population size as the system, the allometric growth of the district is estimated by power regression mention above (Table. 8.1).

**Table. 8.1** Thresholds and Rate of Size Allometry (1951 – 2011)

| Blocks | a | b | t value | Blocks | a | b | t value |
|--------|------|------|---------|--------|------|------|---------|
| Bankura | 172.07 | 1.022 | | Raipur | 152.82 | 0.956 | |
| Onda | 198.23 | 1.097 | | Simlapal | 187.33 | 1.093 | |
| Chhatna | 118.70 | 0.782 | | Taldangra | 191.51 | 1.097 | |
| Gangajalhati | 155.55 | 0.938 | Significant at 95% level | Bishnupur | 204.59 | 1.111 | Significant at 95% level |
| Barjora | 189.34 | 1.062 | | Joypur | 199.70 | 1.097 | |
| Mejia | 152.99 | 0.938 | | Kotulpur | 247.18 | 1.235 | |
| Saltora | 129.29 | 0.837 | | Sonamukhi | 206.30 | 1.125 | |
| Khatra | 139.07 | 0.858 | | Patrasayer | 202.05 | 1.094 | |
| Indpur | 148.18 | 0.922 | | Indus | 231.77 | 1.171 | |
| Ranibandh | 1050.86 | 0.705 | | Bankura District | - | - | |

**Source:** Computed from Census Data (1951 – 2011)

Spatial pattern of population size allometry can easily be revealed from (Fig. 8.1), it clearly shows an increasing size allometry from north-west to south-east. Blocks of the alluvial tracts like Kotulpur and Indas are showing high positive allometry (1.05-1.15) over time. Those are adding more population to that of the district. On the other hand blocks like Bishnupur, Joypur, Patrasayer, Sonamukhi, Barjora, Onda, Taldangra and Simlapal are representing balancing size growth (0.95 - 1.05). They are practically adding population at the same rate to that of the district. Bankura and Raipur are lower than the district allometric growth (0.85 - 0.95). Other

blocks of the western portion of the district are adding very low population allometric growth (0.65 - 0.85) to that of the population of the district.
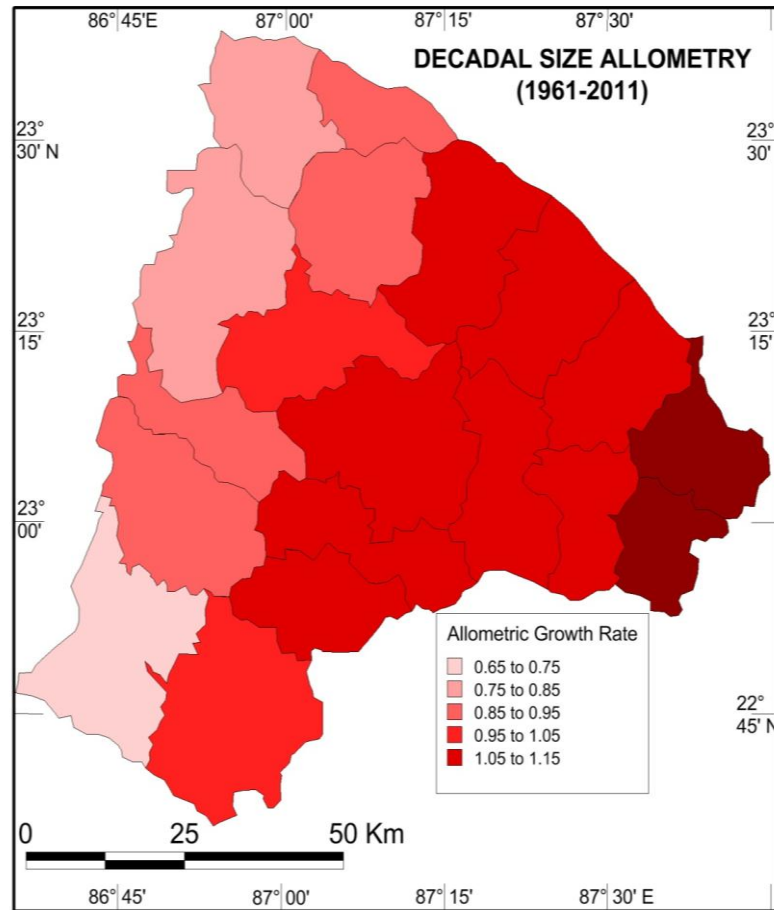


**Fig. 8.1** Block wise Size Allometric Growth Rate (1951 – 2011)

## 8.3 Allometry of Density Growth

While size allometry relates to gaining or losing population of the blocks in respect to district, density allometry signifies relative increasing or decreasing unit area. Population of blocks in respect to the district i.e. which block is accelerating population density to the density of the district and which are decelerating. Population density relates to population per unit area, that denotes space availability as well as intensive use of land (Karmakar, M. 2011).

Density allometry of the blocks (Appendix-XIII) are also showing same trend (Table. 8.2) as that of the size allometry. It is clear from the fig 8.2 that density allometry is sharper than the size allometry as the highest allometry for size is within the range of 1.05-1.15 but for density allometry it is from 1.15-1.25. Spatial pattern of size allometry shows that Kotulpur and Indas with fertile alluvial tract are showing

highest allometry (1.15-1.25) where as western side blocks like Ranibandh, Raipur, Khatra, Indpur, Chhatna and Saltora are in the lowest range (0.65-0.85). Blocks of the plateau fringe of the east like Bishnupur, Joypur, Patrasayer, Sonamukhi, Barjora, Taldangra and Simlapal are depicting balance allometric growth (with the range of 0.95-1.05). They are showing increasing trend of density over time with the District. Once again like size allometry, Bankura and Raipur are showing just losing density allometry (0.85-0.95).

**Table. 8.2** Thresholds and Rate of Density Allometry (1951 – 2011)

| Blocks | a | b | $R^2$ | Blocks | a | b | $R^2$ |
|--------|-----|------|------------------------------|-------------------|------|------|------------------------------|
| Bankura | 1.39 | 1.02 | | Raipur | 1.08 | 0.94 | |
| Onda | 0.44 | 1.09 | | Simlapal | 0.43 | 1.09 | |
| Chhatna | 2.7 | 0.78 | | Taldangra | 0.37 | 1.1 | |
| Gangajalhati | 1.11 | 0.95 | | Bishnupur | 0.57 | 1.08 | |
| Barjora | 0.55 | 1.07 | Significant at 95% level | Joypur | 0.57 | 1.08 | Significant at 95% level |
| Mejia | 1.29 | 0.93 | | Kotulpur | 0.28 | 1.23 | |
| Saltora | 1.93 | 0.84 | | Sonamukhi | 0.41 | 0.98 | |
| Khatra | 1.2 | 0.85 | | Patrasayer | 0.52 | 1.09 | |
| Indpur | 1.46 | 0.91 | | Indus | 0.64 | 1.08 | |
| Ranibandh | 2.86 | 0.7 | | Bankura District | - | - | |

Source: Computed from Census Data (1951 – 2011)
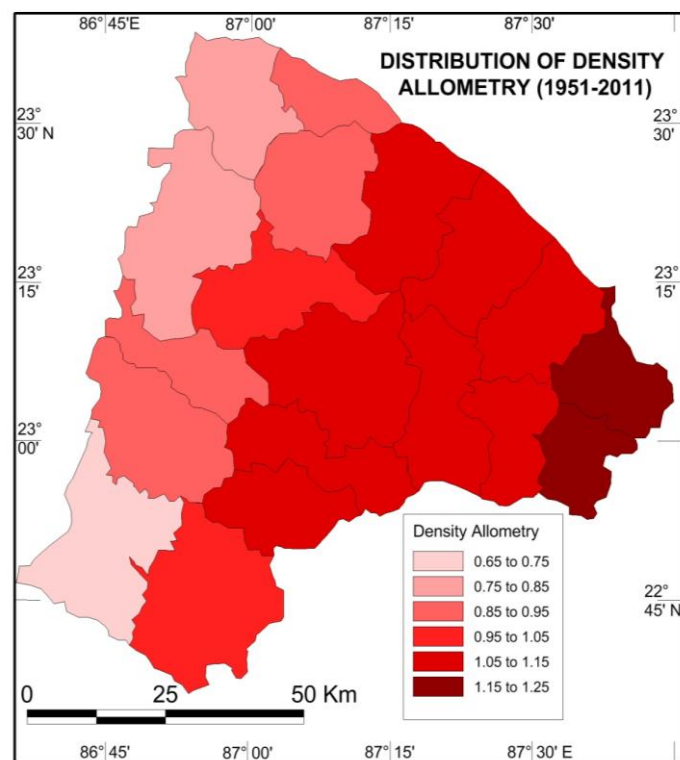


**Fig: 8.2** Block wise Density Allometric Growth Rate (1951 – 2011)

## 8.4 Population Packing: Area Population Relationship

Allometric perspective is not only applied in the system component perspective. It can suitably be used for area-population relationship also. Applying this rule in space with the increase of population over time. The consept of packing and unpacking is very simple to understand. Suppose in a village, 500 people are living in the center of village. With the growth of population normally the settlement will spread out from the centers towards the periphery of the villages theoretically. So this spread of population is known as unpacking which is controlled by the initial value of population (500). This initial value is known as the packed value. Theioretically if the packed value is high, the rate of unpacking value is low and if the packed value is low,it is easy to unpack;thereby the rate of unpacking will be high (Coffy, W. 1981)

In the entire period of investigation from 1951-2011, three time points have been taken into consideration for understanding area-populationship in the form of population packing and the rateof unpacking. Just like the system component growth perspective, the formula was applied through power regression with the form of

$$P = aA^b$$

Where, $P$ is the population, $A$ is the area, $a$ is the packing value and $b$ is the rate of unpacking. Like allometric growth, here also $b$ value is more important as it indicates rate of unpacking of population over the area, i.e. with the growth of population, it is likely to be diffused over the space.

Area-population relationship of 1951 (Fig. 8.3) shows that rate of unpacking was low as all the values are less than one (1). But relatively high rate of unpacking is found for Onda, Indpur, Chhatna, Mejhia and Sonamukhi. Ranibandh is close to this category while the rate of unpacking is lowest for Khatra and Raipur, indicating concentration of population only in some particuler locations. For other blocks it is moderate.

The scenario is changed in 1981 (Appendix-XIV) with increase of rate of unpacking in the entire lateritic tract of Bankura. In 1981, for the first time the rate of unpacking has crossed the value of 1 which is found for Joypur (Fig. 8.4). Moderate value of unpacking is found for Bishnupur, Bankura, Taldangra, Indpur, Gangajalghati and Mejhia. Blocks of northern and western side of the District are show low rate of unpacking. So within this 30 years of span, Chhatna has show weaked unpacking, indicating more concentration of population, while for Joypur, Kotulpur, Bishnupur, Gangajalghati and Barjora, the spilling of population is observed due to increase (Table. 8.3) in rate of unpacking.

**Table. 8.3** Blck wise Threshold of Packing and Rate of Unpcking (1951, 1981 and 2011)

| BLOCKS | 1951 | | 1981 | | 2011 | |
|---|---|---|---|---|---|---|
| | a | b | a | b | a | b |
| Bankura | 15.979*.6309 | 0.268 | 12.394*.8204 | 0.4919 | 16.143*.8173 | 0.5659 |
| Onda | 8.1934*.7545 | 0.406 | 15.968*.7507 | 0.3514 | 13.379*.8549 | 0.5173 |
| Chhatna | 6.5389*.7712 | 0.492 | 26.849*.6192 | 0.3388 | 15.392*.78 | 0.5521 |
| Gangajalhati | 9.7699*.7284 | 0.647 | 13.1390*.7801 | 0.7068 | 16.995*.7974 | 0.7372 |
| Barjora | 14.437*.6751 | 0.299 | 32.719*.6137 | 0.3757 | 13.557*.8512 | 0.6333 |
| Mejia | 6.9205*.7889 | 0.619 | 11.44*.8174 | 0.6561 | 13.259*.8483 | 0.6725 |
| Saltora | 30.909*.5081 | 0.218 | 22.822*.6701 | 0.4298 | 22.089*.7599 | 0.4835 |
| Khatra | 58.164*.3531 | 0.088 | 33.76*.5723 | 0.2486 | 44.561*.5857 | 0.2252 |
| Indpur | 5.7926*.8213 | 0.442 | 14.141*.7571 | 0.3399 | 11.068*.888 | 0.5458 |
| Ranibandh | 13.631*.6314 | 0.284 | 91.957*.3769 | 0.1514 | 118.11*.3996 | 0.1946 |
| Raipur | 35.484*.4547 | 0.226 | 30.408*.6141 | 0.3777 | 34.93*.6369 | 0.4439 |
| Simlapal | 15.049*.6052 | 0.279 | 44.229*.5255 | 0.2199 | 57.855*.5377 | 0.2648 |
| Taldangra | 22.242*.5708 | 0.273 | 11.691*.8230 | 0.4474 | 35.19*.6664 | 0.3344 |
| Bishnupur | 11.953*.6792 | 0.317 | 13.189*.7911 | 0.4546 | 34.93*.6653 | 0.4118 |
| Joypur | 24.594*.5192 | 0.227 | 5.1544*1.0073 | 0.61 | 8.4079*.982 | 0.6447 |
| Kotulpur | 16.311*.5914 | 0.187 | 7.1258*.9348 | 0.465 | 15.051*.8434 | 0.5724 |
| Sonamukhi | 27.604*.5107 | 0.178 | 23.343*.6903 | 0.3626 | 33.457*.6913 | 0.3995 |
| Patrasayer | 8.6991*.7537 | 0.377 | 20.643*.7013 | 0.3777 | 29.879*.709 | 0.5215 |
| Indus | 21.395*.5908 | 0.301 | 25.146*.6786 | 0.4897 | 30.64*.717 | 0.5276 |

**Source:** Calculated from Census Data (1951, 1981 and 2011)
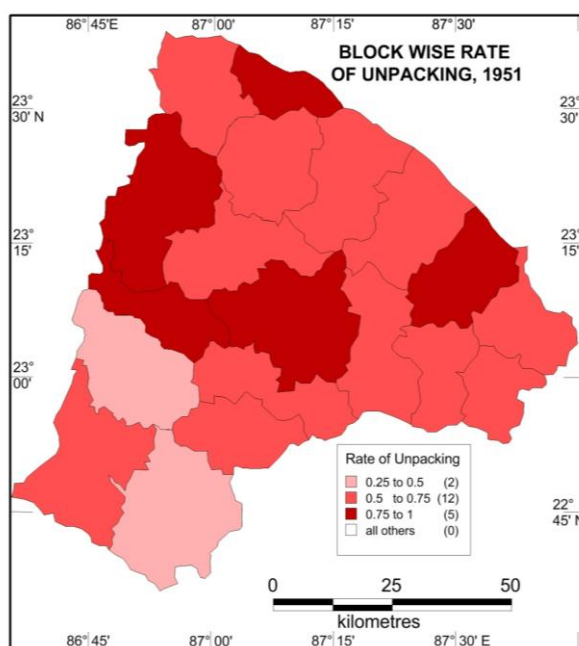


**Fig. 8.3** Spatial Distribution of Rate of Unpacking, 1951
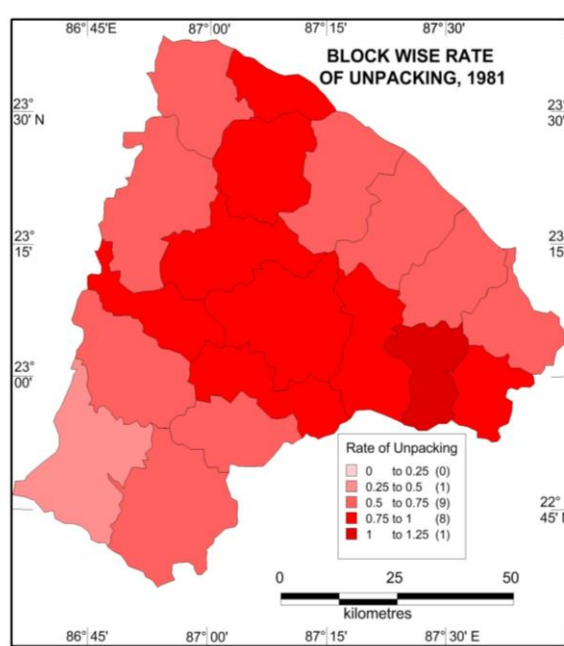
**Fig. 8.4** Spatial Distribution of Rate of Unpacking, 1981
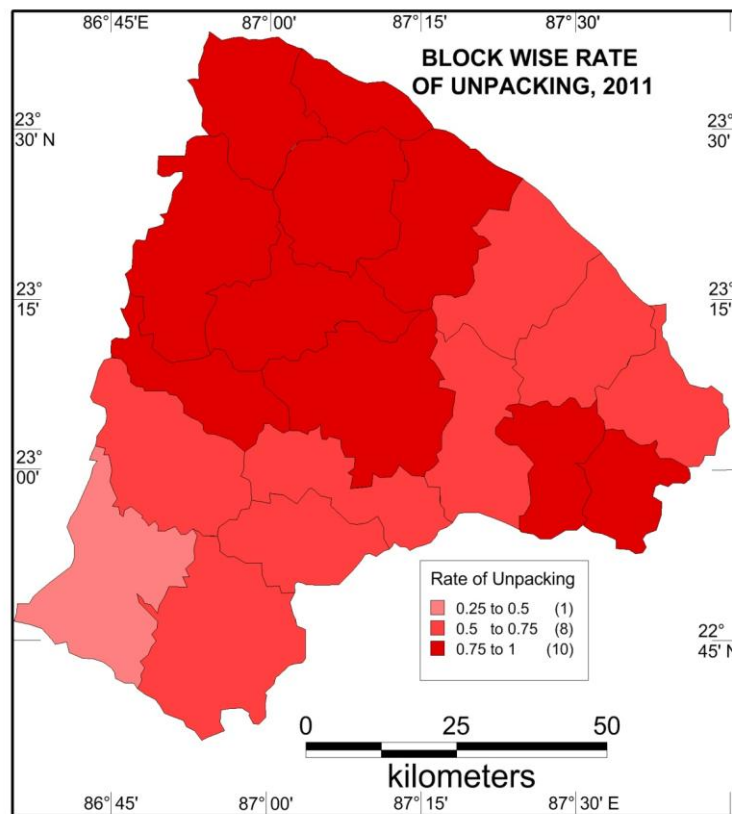
**Fig. 8.5** Spatial Distribution of Rate of Unpaking, 2011

The scenario of 2011 is something different. Out of nineteen blocks, ten blocks are showing high rate of unpacking and apart from Kotulpur and Joypur,all the north western blocks are showing realtively higher rate of unpacking but all the values are less than one (1) (Fig: 8.5). Earlier the size growth rate was uniform, but as the size growth has lower with more uniformity the overall rate of unpacking (Table: 8.3) has decreased but more number of blocks have come out in the relatively higher rate of unpacking.

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## Chapter – 9 : Human Development

- Conceptual Aspect of Human Development

- Human Development Status of Bankura District

- Assessment of Human Development

- Factorial Ecology of the Socio-Economic Development

- Socio-Economic Development through PCA

- Human Development Perspective

- Relation between Socio-Economic Development and Human Development

# Human Development

Research enquiry in the context of population growth and its spatial mosaic becomes almost a mechanical demographic exercise unless and until it is reflected into human development. Increase of population in an area over time becomes a burden for human development unless and until the livelihood is developed. Considering this reality demographic analysis and analysis of population in Geography are ultimately correlated with human development perspective. Therefore, the foregoing discussion entails to adopt human development status of the district at block level to ascertain the level of human development with the 2004 data base and its co-relatedness with socio-economic development with selected parameters of development.

## 9.1 Conceptual Aspect of Human Development

Human development is not a new term at all but its recent time dimension is strikingly different from older concept. The concept of human development is as old as the human civilization. Attempts to conceptualized and explain human development have been made by scholars belonging to different social sciences. In the earlier times in economics, the term 'Human Development' was eagerly concerned with the formation of human capital. Social psychologist on the other hand, place more emphasis on psychological factors like values, motives and attitudes of the people which they believe influence and guide the success of plans for rapid economic development (Pant, S.K. 2006). Sociologists are more oriented to balanced social and livelihood development as the integrating aspect of human development. The world Development Report (WDR) in 1980 has claimed that improvement in some countries, in terms of critical social indicators like education, literacy, life expectancy etc. adopted the view that invest in human development was necessary for poverty alleviation. Sen.'s theory of capability concept not only considers poverty alleviation but also put emphasis on capability as well as discussion of social choice, i.e. the logic of making Governmental choices for society, in welfare economics, in relation to human development. Present concept of human development therefore, not only considers the barriers and level of livelihood but also attempts to scrutinize

spatial mosaic of human development, factors responsible for such variations in spatial mosaic, and also people's desire, dissatisfaction and choices for livelihood development against the backdrop of which planning for future development in relation to human development has been addressed in the last section of this chapter.

## 9.2 Human Development Status of Bankura District

To assess the perspective of human development at state level as well as district level, Government of India follows the universal rule as suggested by the UNO. The status of human development of West Bengal is not so much impressive. In terms of Human Development report (2004), West Bengal occupies $8^{th}$ position among 15 major states (Datt, R. and Sundaram, K. P.M. 2009). The scenario of Bankura is more depressive as per the rank of District level human development of 2004 and 2009,the district is at $11^{th}$ position out of the then sixteen districts (presently 19 districts ) with the composite index of 0.52 for below the state level (0.61) (HDI report). In respect of parameters, health index is appreciably high (0.67) with respect to other two parameters (Table. 9.1).

**Table. 9.1** Human Development Indices with respect to West Bengal (2004)

| District | Health Index | Income Index | Education Index | HDI (composite Index) | HDI rank |
|----------|--------------|--------------|-----------------|-----------------------|----------|
| Bankura | 0.67 ($8^{th}$ ) | 0.26 ($14^{th}$ ) | 0.62 ($11^{th}$ ) | 0.52 | $11^{th}$ |
| West Bengal | 0.7 | 0.43 | 0.69 | 0.61 | - |

Source: District HDR, 2004

The worst performance is found for income index (0.26 with respect to state index 0.43) having the rank of $14^{th}$. Education index is not so better (0.62 with respect to state index 0.69) having the rank of $11^{th}$ (Fig. 9.1).
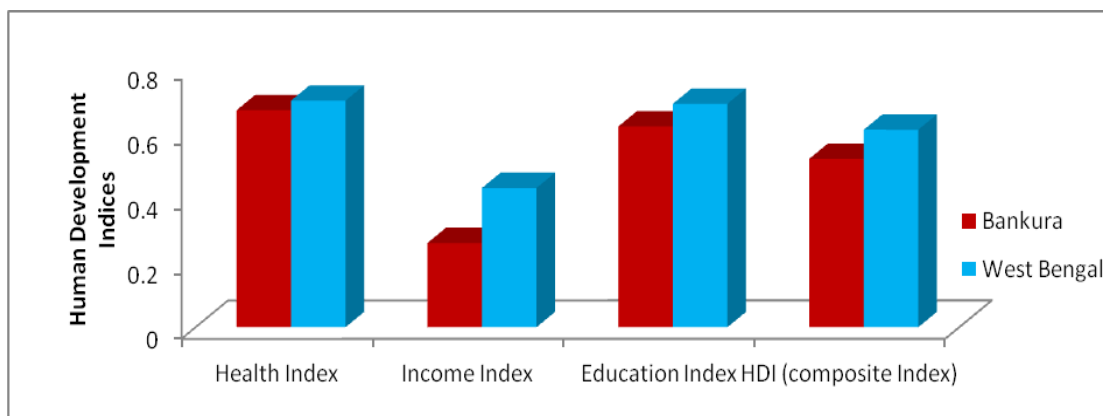


**Fig. 9.1** Human Development Indices of Bankura district (2004)

The reasons for low income index is due to its over whelming rural population where the return from agriculture is very low. Even 2011 census has enumerated rural population of 91.67 %. Through out of the period of observation (1951-2011), it is more than 90 percent. Low amount of urban population and very low industrial output is responsible for low income index. Being located in a drought prone area with appreciably low soil fertility, the livelihood and income source of rural population is low. Except Bardhaman, Rarh Bengal districts are associated with high rural population with marginal propensity to income from agriculture. Therefore income indices of Purulia, Bankura, West Midnapur and Birbhum are very low in comparison to other districts of West Bengal. Same reality is found for Bankura.

Education index is satisfactory; in the sense that children drop out as estimated in 2004-2005 was appreciably low. For most of the blocks it is lower than 12%. Only for two blocks, it is more than 15%. Even for some blocks (Joypur, Raipur, Simlapal and Taldangra) percentage of out of school children is less than 2(where as district level is 4.44 %) (District Human Development Report, Bankura, 2006). This low percentage of out of school children is not a sporadic event rather a consistent phenomena for which the literacy index is very close to the state average.

High health index cannot be claimed as the reflection of good health infrastructure of the district. Rather infrastructural facility at block level is low due to poor connectivity with the health centers. Even workers and bed-patients and doctors patient ratio are not so satisfactory; at the same time, private health care facilities are not so much developed at block head quarters. Rather than all these health facilities, health index is mainly related with the life expectancy. Perhaps, predominant rural population has high life expectancy at birth which has been reflected in health index (8th position out of sixteen districts).

The glimpses of Human development are discussed at block level with the help of radar indicators later on. People's desire, dissatisfaction and choices are also addressed collecting data from village level sample survey. This certainly will outline future courses of Human development.

## 9.3 Assessment of Human Development

In the preceding section 'human development' of the district has been discussed at a general scale on the basis of three basic factors under the aegis of

United Nations development Programme (UNDP), a standard methodology developed since 1990 when the first human development report was published. Three basic indicators are considered for assessing relative position of the countries in the perspective of human development ladder-life expectancy at birth representing health status, literacy rate and combined gross enrolment in the primary, secondary and tertiary education indicating attainment in the domain of knowledge and the third one is the gross domestic product signifying attainment in the income sectors. One important consideration is that equal weightage has been given to three indicators. But a researcher can take other variables according to the need to explain human development at regional or local scale. Following sections crop up this perspective.

## 9.4 Factorial Ecology of the Socio-Economic Development

Considering the limitations of three indicators at micro scale (block level), the present study has been carried out to study the socio-economic development perspective (Karmakar, M. 2011). A lot of factors can be included for evaluating socio-economic development perspectives. But only seven (7) factors have been included here considering the domination of rural population in the district as well as limitations of data base at block level. At the same time, urban and industrial parameters or workers category has been carefully avoided because of the absence of data base in the most of the rural blocks.

The whole analysis of human development has been addressed in a single framework by the factors responsible for development. Factors facilitating development are addressed as development perspectives.

The whole analysis has been presented in two time frames -1981 and 2001. World development report was initiated in 1980's and socio-economic development report was published in 1991. Therefore, the development has been addressed in two different time frame-1981 and 2001 of the district to make a comparative assessment of development at block level. The whole enquiry has been treated by factor analysis to find out the reality of socio-economic development in each block in terms of development criteria. The under lying factors are there after analyses for suggestive measures for socio-economic development of the area.

## 9.5 Socio-Economic Development through PCA

District Bankura is basically pronounced by agricultural activity. Therefore agricultural variables have been considered first priority. Education, health and energy facility has been also given priority (Appendix-XV). The selected variables and the reason for selection are given below.

1. Percentage of arable land ($x_1$) - Arable land is the back bone of rural economy. Bankura have a rural population of 90% within the period of investigation (1951-2011). Therefore economic development perspective is associated agrarian economy where percentage of arable land is the most important variables.

2. Percentage of irrigated area ($x_2$) - The busting agrarian economy in India is the gift of green Revolution. After this episode, percentage of irrigated area has become the integral indicator of agricultural development. Therefore percentage of irrigated area is an important indicator. During eighties, the spread of irrigation was very low in West Bengal and also Bankura. Now it is developed even in Bankura. Therefore, for comparative assessment of 1981 and 2001, percentage of irrigated area has been taken into consideration.

3. Number of villages served by 100 primary schools ($x_3$) - Education is basic element for awareness development and elementary education plays the vital role for that especial in rural society. Therefore, number of villages served by 100 primary schools has been taken as variable. High school and higher education have been avoided due to its heterogeneous performance and role in the block level study.

4. Number of villages served by 100 primary health centers ($x_4$) - Health is the most important aspect of social development for which people are careful and worried irrespective of caste, creed, religion and economy. Therefore, number of villages served by 100 primary health centers has been taken as the variable, as it is the most important health facility for the rural areas.

5. Percentages of electrified villages ($x_5$) - Availability of modest energy at the rural level is important from social as well as economic perspectives. Therefore percentage of electrified villages is taken as socio- economic indicators.

6. Literacy ($x_6$) - Higher literacy indicates social awareness as an important of socio-economic dimension.

All these six indicators are treated for principal component analysis of which first two are economic, third and forth are social while fifth and sixth are socio-economic indicators. Other indicators like school enrolment ratio, doctor- population ratio, female literacy rate, distance of villages from the *pucca* road, number of small scale industries or banks in the blocks. But those are avoided due to either include within the considered variables or for their very low responses in some blocks for which the analysis may be diluted. More importantly, to make a parity as well as comparison between 1981 and 2001 data base and also availability of data and its ubiquitous spread over the blocks, the six variable have taken. To make parity with human development of 2004, rather than 2011 data, 2001 data has been taken into consideration.

**9.5.1 Socio-Economic Development through PCA (1981)**

Socio-economic development perspective is now unfolded taking these six (6) variables that has immense importance in the rural space of Bankura. The reflection of the variables through eight vectors and quadrate analysis are explained first, subsequently by the PRIN-score (Z-score) of the blocks under the above the six variables.

*9.5.1.1 Responses of the Variables (1981)*

In the PCA-1 with explained variation of 32.21%, (Table: 9.2b), the variables (Table: 9.2a) relating to socio-economic development of 1981 data base show that out of six variables percentage of irrigated area ($x_2$) is showing high positive correlation (+0.813) while number of villages served by the 100 primary health centers is negatively correlated. Thus it can be referred that rather than arable land, irrigation facilities is more accelerating factor for development. Because most of the blocks are associated with more than 70% of arable land in 1981 (Appendix-XVI) but blocks facilitated by irrigation facility are more important in fostering economic development. Number of villages served by 100 primary health centers is show highly inverse correlation as blocks with huge number of villages in the plateau fringe areas are depicting smaller number of primary health centers where as plain areas like Kotulpur, Indus and urban areas like Bankura and Bishnupur had high number of primary health centers. This wider asymmetry of health centers is responsible to show inverse correlation. On the other hand, arable land is moderately facilitating (Eigen

vector 0.440) the development and percentage of electrified villages are negatively correlated (Eigen vector -0.581). The skewed data base of primary health centers and percentage of electrified villages are showing inverse relation with the development in PCA-1. But literacy rate and number of villages served by 100 primary schools are to run the system at the first place.

**Table. 9.2a & b** Factor Lodgings and Explained Variation, 1981

| Variables | Component | |
|---|---|---|
| | 1 | 2 |
| % of arable land ($x_1$) | 0.440 | - 0.654 |
| % of irrigated area ($x_2$) | 0.813 | 0.190 |
| No. of village served by 100 primary schools ($x_3$) | 0.053 | - 0.049 |
| No. of village served by 100 health centers ($x_4$) | - 0.761 | 0.125 |
| No. of electrified village ($x_5$) | - 0.581 | 0.208 |
| % of literacy ($x_6$) | 0.399 | 0.882 |

Extraction method : Principal Component Analysis (9.2a)

| Component | Initial Eigen Values | | |
|---|---|---|---|
| | Total | % of Variance | Cumulative % |
| 1 | 1.933 | 32.213 | 32.213 |
| 2 | 1.303 | 21.723 | 53.936 |
| 3 | 1.155 | 19.256 | 73.192 |
| 4 | 0.993 | 16.558 | 89.750 |
| 5 | 0.496 | 8.267 | 98.016 |
| 6 | 0.119 | 1.987 | 100.000 |

Extraction method : Principal Component Analysis (9.2b)

In the PCA-2 with explained variation of 21.72% (Table. 9.2b), literacy rate is showing high positive correlation while arable land is representing high negative correlation. So in the second stage literacy and arable land are the main factors (Table: 9.2a) while others have negligible role. So literacy is the important factor for socio development but not for the economic development, as it responses at the second stage. Arable land is negatively correlated in the second stage, as arable land without irrigation facilities in the plateau fringe areas is no more a productive land at all, if the rainfall is low.

Scree plot (Fig. 9.2) shows that out of six stage analysis, $1^{st}$ three stages are important as the eigen value are more than one and the cumulative variance up to third stage is more than 70%. Even forth stage is important as it explains 17% of the total explanation, but theoretically it is not important as the Eigen value is less than one.
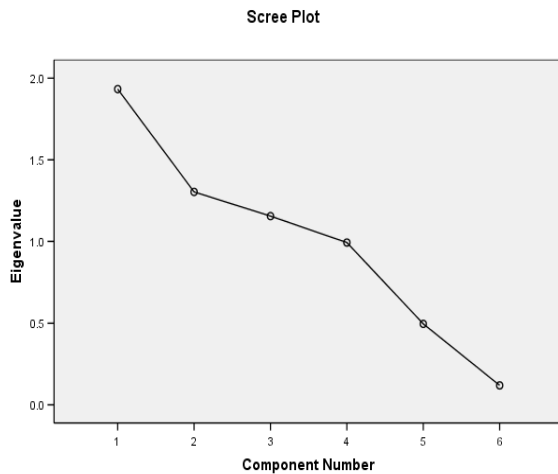
**Fig. 9.2** Scree plot of socio-economic development (1981)
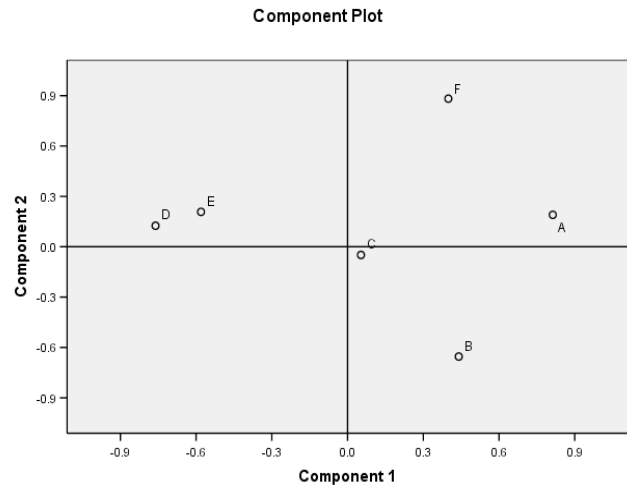


**Fig. 9.3** Component plot of socio-economic development (1981)

Tri-phase analysis is more important by cubic representation, but it is difficult to perceive the dimension clearly. For better understanding component plot is shown (Fig: 9.3) in a biaxial framework to perceive the role of the variables in two stages.

Plot clearly sparks that percentage of irrigated areas and literacy rate is promoting development in both first and second phase, while arable land is promoting at the first phase, but retarding at the second phase and conversely health centers and electrified villages are retarding development in the first phase but accelerating it in the second phase,. Role of primary school is insignificant in both the phases.

*9.5.1.2 Responses of the Blocks (1981)*

The scores of the blocks are defined after extracting the Eigen value and Eigen vectors of the variables of PCA-1 and PCA-2. This score is popularly known as PRIN-score expressed as

$$Z_1 = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6,$$

where $x_1, x_2, \ldots x_i$ are the variables initial loading of data matrix (Appendix-XVI ) and $a_1, a_2, a_3 \ldots a_6$ are the slope where $a_i$ is the ratio of respective eigen vector and square root of eigen value ($\alpha/\sqrt{x}$). This Z score normally has a range within +3 and -3 are mosaic in by choropleth maps of the blocks showing spatial pattern of human development. Maps (Fig. 9.3 a & b), shows the spatial difference of socio-economic development under the six variables in two stages (PCA-1 and PCA-2). Through PCA-1 shows that in the first stage of 1981 data base. Indus, Joypur, Simlapal and Raipur are showing high Z-score depicting better socio-economic development, while blocks of the lateritic landscape like Bishnupur, Taldangra,

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Indpur are showing moderate development(Z score 0-1) where as north western blocks even Bankura and Chhatna are showing poor performance. Poor performance of Bankura and Chhatna are not the reality as industrial and urban functions are excluded in this analysis.
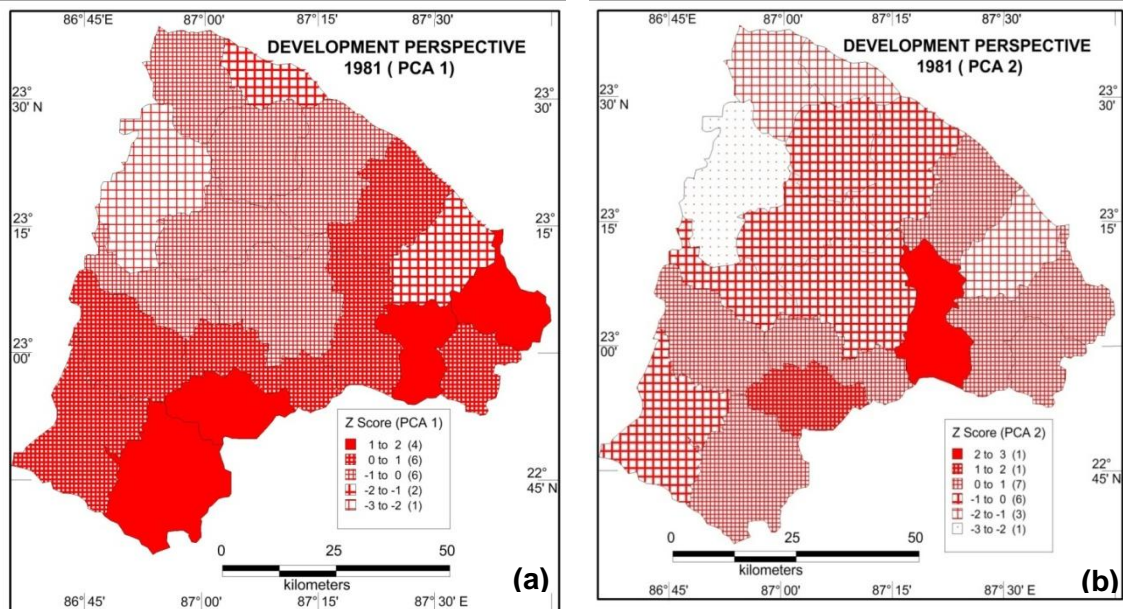
Fig. 9.3a & b Perspective of socio-economic development (1981)

Through PCA-2 shows that Bishnupur is showing better performance, while entire south-eastern blocks (Simlapal, Indus, Kotulpur, Joypur, Taldangra and Raipur) are also showing moderate performance (Z-score within 0- +2) and in the same way western blocks except Indpur are showing low performance (Z-score within 0- -3).

So through the two stage analysis of spatial responses it is clears that Indus, Bishnupur, Joypur, Simlapal and Raipur are show better socio-economic developments. But after all entire south-western blocks are showing positive Z-score in PCA1 or PCA2 or in both, while north-western blocks are showing negative Z-score both in PCA1 and PCA2 of 1981.

Quadrant representation (Fig: 9.4) on the basis of PCA-1 and PCA2 Z-score of the blocks clearly depicts location of the blocks either in ++ quadrant or –quadrant with the exception of Ranibandh. Relatively socio-economically developed blocks (Bishnupur, Simlapal, Indas, Raipur, Joypur, Sonamukhi, Kotulpur, Khatra, Taldangra and Indpur) are located in the ++quadrat while relatively laggard blocks (Barjora, Onda, Gangajalghati, Bankura, Mejhia, Saltora, Patrasayer and Chhatna) are located in the- quadrat.
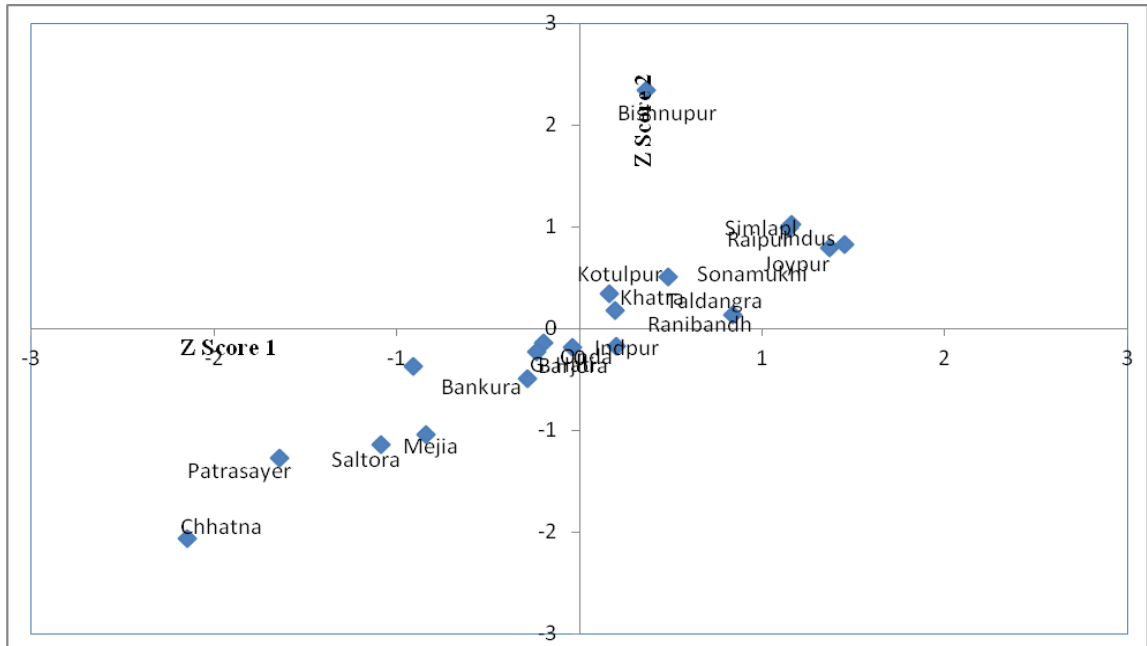
**Fig 9.4** Quadrant analysis of socio-economic development (1981)

## 9.5.2 Socio-Economic Development through PCA of 2001

All the six variables taken for socio-economic development of 1981 are employ in2001 to perceive the difference of socio-economic development from 1981 to 2001 and the role of respective variables. Reasons for the selection of variables are the same as it is explained for 1981.

*9.5.2.1 Response of the Variables (2001)*

Responses of the variables in 2001 (Appendix-XVII) are far and wide different. In the PCA, all the variables are showing positive loading (Table. 9.1) except literacy rate. Similarly all the variables except health facilities and arable land are showing positive loading in PCA-2.

**Table: 9.2** Component matrix of socio-economic development (2001)

| Variables | Component | |
|---|---|---|
| | 1 | 2 |
| % of arable land ($x_1$) | .081 | -.351 |
| % of irrigated area ($x_2$) | .379 | .464 |
| No. of village served by 100 primary schools ($x_3$) | .545 | .048 |
| No. of village served by 100 health centers ($x_4$) | .858 | -.152 |
| No. of electrified village ($x_5$) | .552 | .548 |
| % of literacy ($x_6$) | -.403 | .857 |

In the PCA-1 health facilities (number of villages served by 100 primary health centers) is showing highest loading (0.858) where as number of village served

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by 100 primary schools and percentage of electrified villages are showing moderate positive loading (0.545 and 0.552 respectively). Literacy is negatively correlated with loading -0.403. This is due to asymmetric of literacy in respect to other variables. So while irrigation facility and arable land was the dominating factor of socio-economic development in 1981, presently (2001) the role is performed by the health, education and electricity are more akin to socio-economic development of the blocks at the first phase with explained variation of 27.52% (Table: 9.3).

**Table: 9.3** Explained variation of socio-economic development (2001)

| Component | Initial Eigen Values | | |
| --- | --- | --- | --- |
| | Total | % of Variance | Cumulative % |
| 1 | 1.651 | 27.524 | 27.524 |
| 2 | 1.398 | 23.302 | 50.826 |
| 3 | 1.086 | 18.102 | 68.927 |
| 4 | 0.876 | 14.604 | 83.531 |
| 5 | 0.788 | 13.140 | 96.671 |
| 6 | 0.200 | 3.329 | 100.000 |

Low response of irrigation facility and arable land are signifying marginalization of agriculture. The same view is finding out by the Mahapatra, R. (2007) in his thesis of agricultural perspective of West Bengal.

In the second stage analysis (PCA-2), it is clear that literacy which is negatively correlated in PCA-1 has emerged as the dominant factor in fostering socio-economic development. Moderate positive loading are found for electricity facility (0.548) and scope of irrigation have a tendency to show positive correlation though weak. Thus these two variables are sustainably important for socio-economic development. Arable land for its very low positive loading (0.081) in PCA-1 and negative loading (-0.351) in PCA-2 is reflecting diminishing role of agriculture for socio-economic development with explained variation of 23.02% (Table. 9.3).

Scree plot shows that in terms of explained variation, out of six stages five are important (Fig. 9.5) signifying the role of five factors for socio-economic development of 2001 under these construct variables. But three are more important as at the fourth stage the Eigen value is lower than one. So, cubic quadrant representation is a better reflection of variables but biaxial representation is preferred for better understanding.

Component plot (Fig. 9.6) thus clearly tells about the responses of the variables. Due to positive loading both in PCA-1 and PCA- 2,electric facility, irrigation facility and number of villages served by 100 primary schools are located in the ++ quadrant. Therefore those variables are persistent for socio-economic development of the blocks in accordance with 2001 data base. On the other hand, health facility (number of villages served by 100 primary health centers) and arable land are located in the +- quadrant voicing accelerating socio-economic development at the first phase and decelerating development at the second phase, not in the first stage.
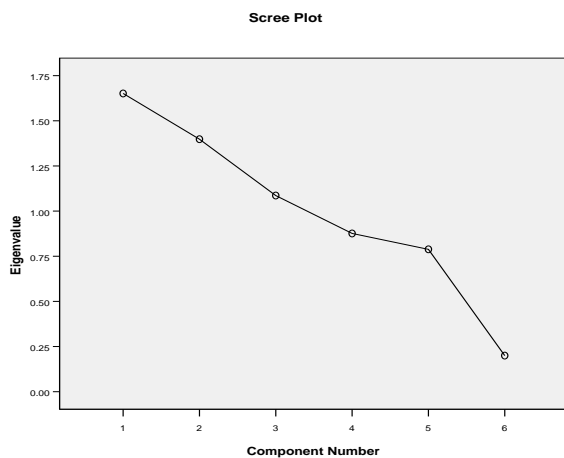


**Fig: 9.5** Scree plot of socio-economic development (2001)
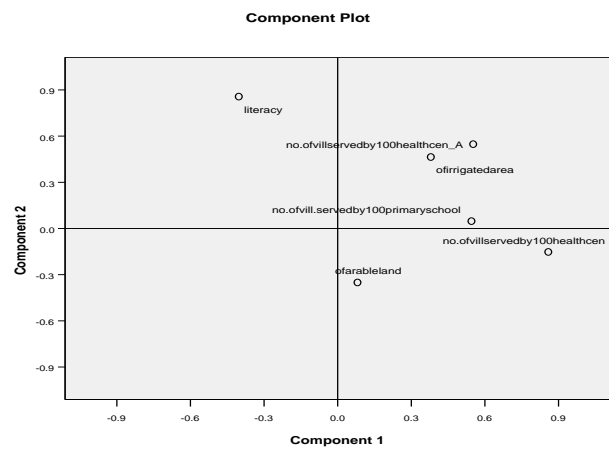
**Fig: 9.6** Component plot of socio-economic development (2001)

## 9.5.2.2 Responses of the Blocks (2001)

Extracting the component loading and Eigen value of PCA-1 and PCA-2, the PRIN score of the blocks are calculated with the initial data matrix and the slop, as it is done for 1981. The PRIN score are transformed into Z-score and subsequently are represented through choropleth maps (Fig. 9.7a & b) of PCA-1 and PCA-2 respectively for analyzing spatial variation (Appendix-XVIII).
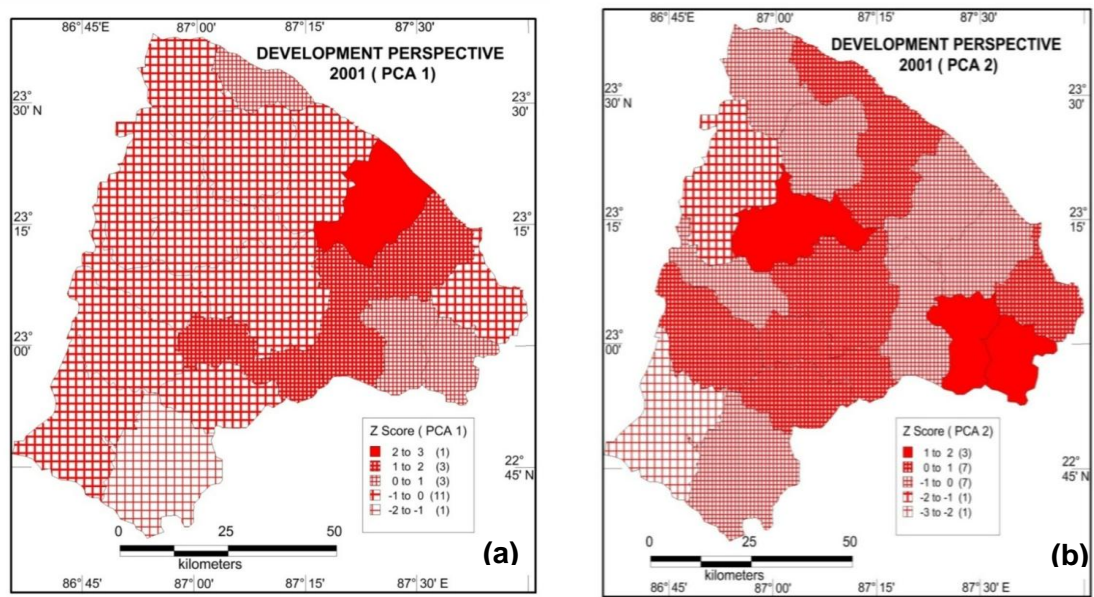
**Fig 9.7a & b** Perspective of socio-economic development (2001)

Socio-economic development perspective of 2001 under PCA-1 (Fig: 9.7a) shows that Barjora is taking the highest loading position (Z-score within 2-3) while Sonamukhi, Bishnupur, Taldangra, are showing moderate development with Z-score 1-2, while Joypur and Kotulpur are show positive Z-score (within 0-1). Ironically Indas has enrolled in the negative Z-score, somewhat exception to that of the south eastern blocks. Rest of the blocks is showing negative Z-score.

Map prepared by PCA- 2 values (Fig: 9.7b) is quite different. In the second phase of socio-economic development Bankura and Kotulpur are showing highest score with the value of 1-2, whereas blocks around Bankura like Barjora, Onda, Taldangra, Simlapal, Indpur and Mejhia along with Indas are showing moderate development with Z-score values 0-1. Rests of the blocks are showing negative Z-score. So apart from the blocks of the alluvial tracts, a secondary axis of socio-economic development is being established around the urbanization dominated blocks of Bankura District 2001.

Quadrat analysis of socio-economic development based on 2001 data base shows an almost (Fig: 9.8) equal amount of blocks in four quadrants which is strikingly different from 1981 scenario. Kotulpur, Joypur, Mejhia and Taldangra are located in the ++ quadrat, Patrasayer, Sonamukhi, Bishnupur are in +- quardat, Bankura, Khatra, Barjora and Simlapal are in -+ quadrat while Onda, Indpur, Chhatna, Gangajalghati, Saltora, Raipur and Ranibandh are located in the -quadrat.

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These six blocks are the laggard blocks of which Ranibandh is the most laggard block. This is surely the emerging reality of Bankura, that these six blocks should be given proper attention in terms of development of agriculture, health, education and also electrification. Due to topographic barrier, agricultural development is not possible here. Therefore income generation may be possible by the successful implementation of MGNREGA. But health and educational development should be giving more priority for awareness development of the people of those blocks, where tribal concentration is high.
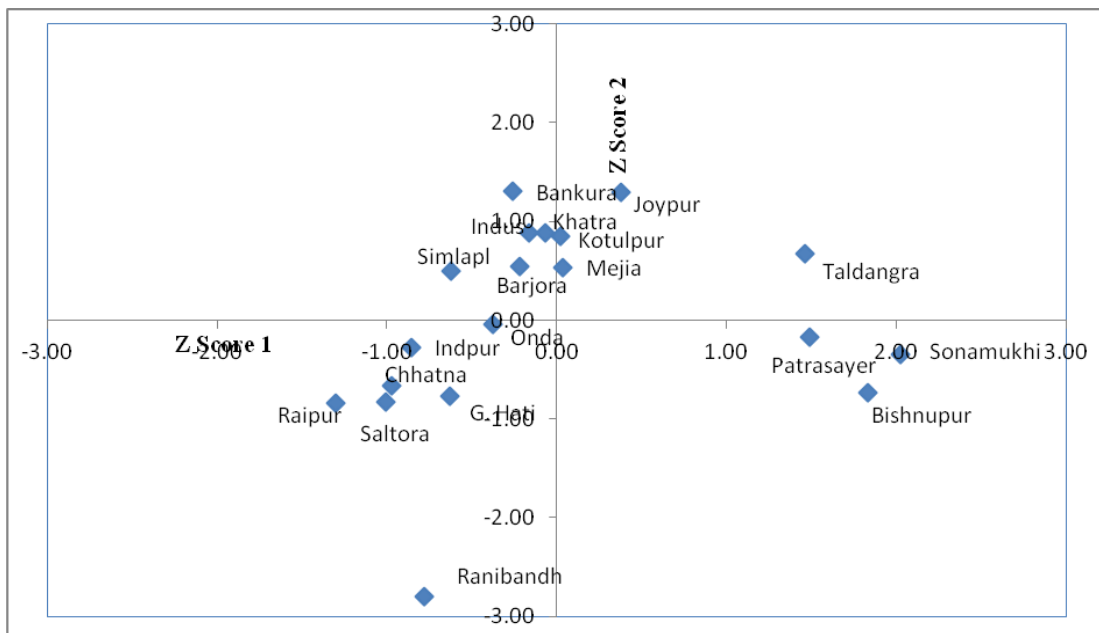
**Fig. 9.8** Quadrant analysis of socio-economic development (2001)

## 9.6 Human Development Perspective

This research from the very beginning had the notion to establish the relationship between spatial pattern of population growth and human development. But human development at block level cannot fully be expressed with the perspective of UNDP consisting on three basic variables. Therefore it has been ascertained by the variables selected from the District Human Development Report, Bankura (2004). In that report, eight variables have taken into consideration and status of the blocks is analyzed by each variable. But present analysis is quite different from this analysis of each variable.

**Table. 9.4** Block-wise Human Development Score through Indices

| Blocks | Index Value | | | | | | | HDI Score |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Gross Output | Wage Level | Enrolment | Female Literacy | Institutional Delivery | Sanitation | Cumulative Score | |
| Bankura | 1.80 | 2.93 | 3.95 | 2.45 | 2.85 | 3.29 | 17.27 | 57.56 |
| Onda | 1.09 | 3.09 | 4.19 | 2.3 | 2.21 | 0.53 | 13.41 | 44.70 |
| Chhatna | 0.92 | 2.57 | 4.07 | 1.62 | 1.22 | 1.87 | 12.27 | 40.90 |
| Gangajalhati | 0.93 | 3.31 | 3.96 | 2.25 | 3.23 | 0.98 | 14.66 | 48.86 |
| Barjora | 0.67 | 4.04 | 3.9 | 2.81 | 3.09 | 1.16 | 15.67 | 52.32 |
| Mejia | 0.62 | 3.68 | 3.98 | 2.21 | 3.35 | 1.31 | 15.15 | 50.50 |
| Saltora | 0.61 | 2.94 | 3.63 | 1.91 | 1.50 | 0.79 | 11.38 | 37.93 |
| Khatra | 0.56 | 3.13 | 4.59 | 2.52 | 1.97 | 0.89 | 13.66 | 45.53 |
| Indpur | 0.76 | 2.94 | 3.73 | 2.27 | 1.38 | 1.16 | 12.24 | 40.80 |
| Ranibandh | 0.56 | 2.57 | 3.94 | 2.21 | 2.1 | 0.53 | 11.91 | 39.70 |
| Raipur | 0.53 | 2.75 | 4.35 | 2.21 | 1.91 | 0.49 | 12.24 | 40.80 |
| Simlapal | 0.78 | 2.94 | 4.97 | 2.47 | 1.83 | 0.52 | 13.51 | 45.03 |
| Taldangra | 0.73 | 3.31 | 4.88 | 2.69 | 3.32 | 0.86 | 15.79 | 53.63 |
| Bishnupur | 1.01 | 4.04 | 4.52 | 2.26 | 3.05 | 2.66 | 17.54 | 58.48 |
| Joypur | 0.89 | 4.63 | 4.33 | 2.75 | 1.74 | 1.11 | 15.45 | 51.50 |
| Kotulpur | 0.91 | 4.63 | 4.31 | 2.9 | 2.85 | 4.89 | 20.45 | 68.30 |
| Sonamukhi | 0.83 | 4.04 | 4.6 | 2.52 | 2.89 | 1.30 | 16.18 | 53.93 |
| Patrasayer | 0.91 | 4.41 | 4.52 | 2.22 | 1.20 | 0.71 | 13.97 | 46.56 |
| Indus | 1.18 | 4.78 | 3.99 | 2.72 | 1.99 | 4.90 | 19.56 | 65.20 |

Source: District HDR, 2004

For this enquiry six variables are taken into consideration and two variables are taken into consideration and two variables are left out. Under such a judgment each variable each is theoretically in terms of index where the lowest value is 0 and the highest value is 5 (Appendix-XIX). So performance of nineteen blocks are measured within this range where the better performance is credited if a block have value more than the half of the range i.e. 2.5. So under a particular variable, the blocks which have index value more than 2.5 are considered good in terms of performance (Table. 9.4). The variables which are taken into consideration are:

1. <u>Gross out-put Index (2004)</u>: By gross output index, economic soundness of a profile can easily be perceived. In terms of gross output index all the blocks are showing low value. Only three blocks namely Onda, Kotulpur and Indas have the

value (Fig. 9.9) more than one where the highest value is five and at the same time wider variety is not found among the blocks.
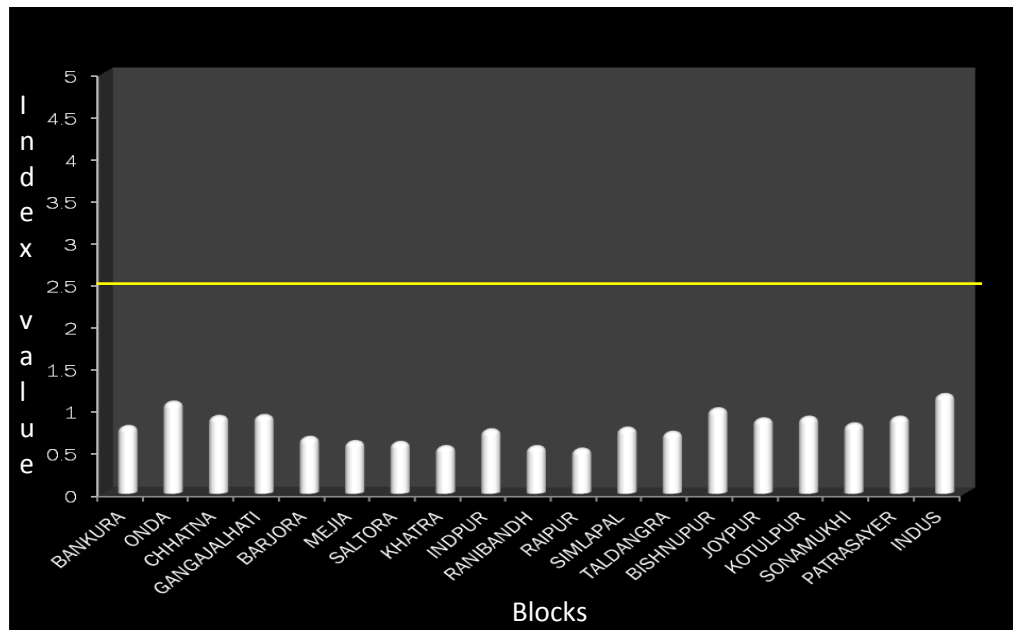
**Fig. 9.9** Block wise Gross output index (2004)

2. <u>Wage level Index (2004)</u>: It shows not only the earning but also the livelihood security in terms of earning. All the blocks have registered values higher than the standard value of 2.5(Fig:9.10). But Barjora, Bishnupur and Sonamukhi have achieved value more than (4) while Joypur, Kotulpur, Patrasayer and Indas have scored more than 4.5.
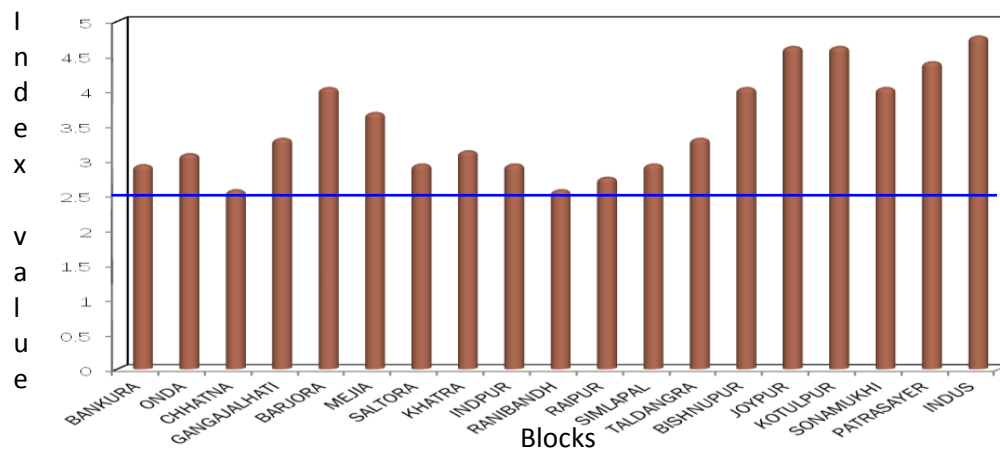
**Fig. 9.10** Block wise Wage Level Index (2004)

3. Enrolment Index (2004): Enrolment index not only defines the educational attainment it also signifies spread of education over the time, because enrolment index is not raised over night. In terms of enrolment index all the blocks are showing very high performance (Fig. 9.11) as most of the blocks have index value higher than four with the exception of Saltora, Barjora, Gangajalghati and Bankura. Even the laggard blocks defined in socio- economic development like Ranibandh, Indpur, Taldangra and Khatra are showing very high performance with index value more than 4.5 along with Bishnupur, Sonamukhi and Patrasayer.
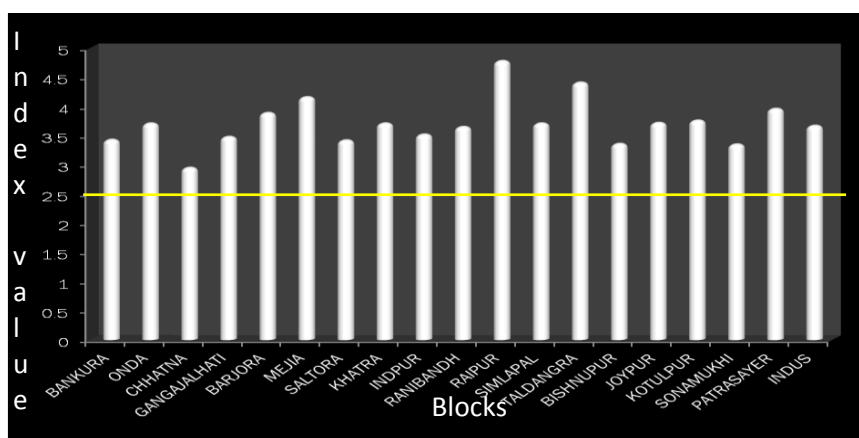


Source : Computed from Table 9.4

**Fig. 9.11** Block wise Enrolment Index (2004)

4. Female literacy Index (2004): Female literacy is not only the reflection of development of education or female educational attainment; it also upholds the social development perspective, as higher female literacy indicates better position of the females in the society. All the blocks are rather performing low against this variables (Fig. 9.12) as most of the blocks have registered indices lower than the standard value 2.5 with the exception of Bankura, Barjora, Khatra, Taldangra, Joypur, Kotulpur and Indas and no blocks has crossed the value of three.
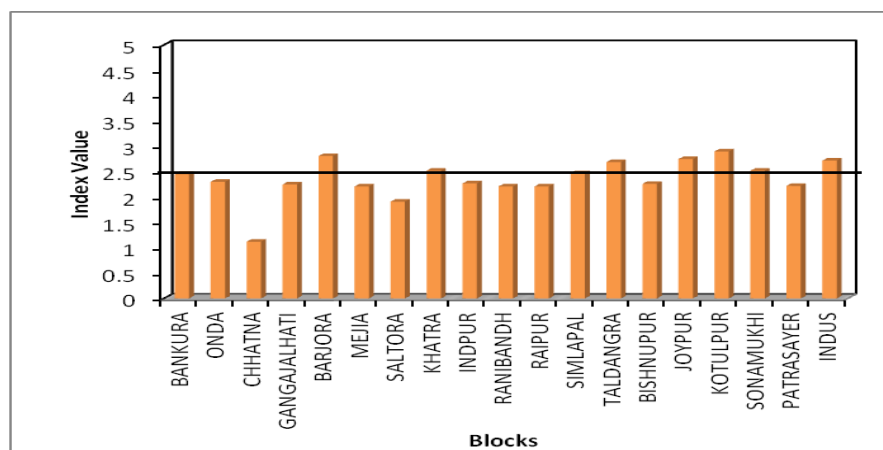
**Fig. 9.12** Block wise Female Literacy Index (2004)

5. <u>Sanitation Index (2004)</u>: Sanitation index is considered as the health status in the rural areas. Good sanitation system leads to increase life expectancy. That is the reason to consider it as a factor of human development at village level. In Bankura District, sanitation index is very low for most of the blocks (Fig. 9.13), as only two blocks have registered indices higher than the standard level (>2.5).Only Kotulpur and Indas are loaded with very high index i.e. very close to 5. Only three blocks namely Bankura, Indpur and Ranibandh has crossed the 1.5 barrier, low than the standard level.
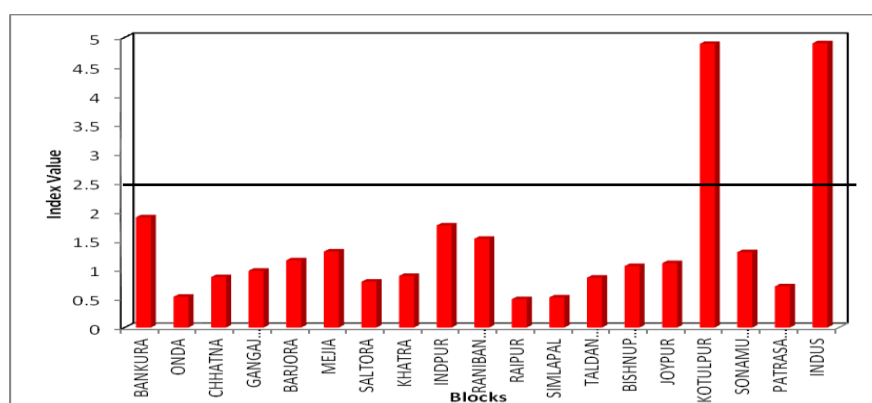
**Fig. 9.13** Block wise Sanitation Index (2004)

6. <u>Institutional Delivery Index (2004)</u>: Institutional Delivery Index is an important index of health facility as well as health awareness. Therefore it has been considered as an important indicator of human development at block level. Institutional delivery of the blocks is very poor as most of the blocks are showing value lower than the standard value of 2.5 (Fig. 9.14). Only six blocks are showing indices higher than 2.5.
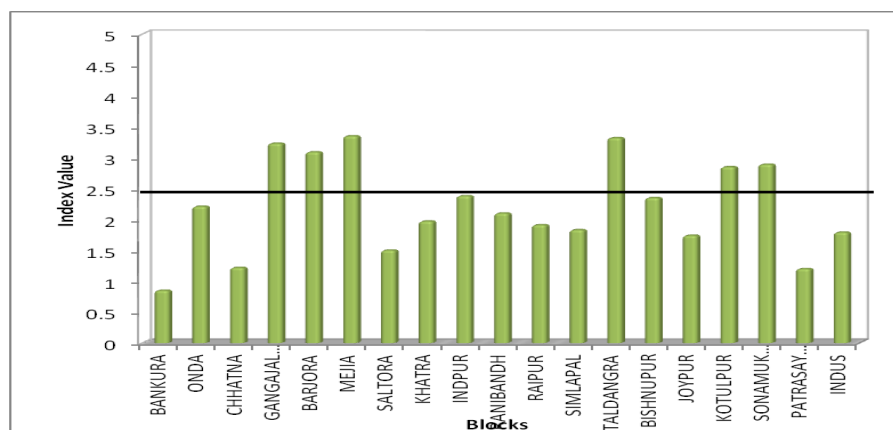
**Fig. 9.14** Block wise Institutional Delivery Index (2004)

In the District Human Development Report eight (8) factors have been taken into consideration. Two factors viz. vulnerability index and malnutrition index have been excluded as they may dilute the cumulative score and their decelerating impact. Other six (6) factors are treated into cumulative score and transformed into Human Development Index. This HDI is once again correlated with socio-economic development for explaining correlation between socio- economic development and HDI of the blocks. As chosen variables of socio- economic development considers accelerating factors in context to backwardness index. Therefore, the decelerating factors in Human Development Index prepared by Government of West Bengal like sanitation and malnutrition have been excluded. Cumulative scores of the variables of Human development are now transferred into weighted index, dividing the cumulative score of each block by thirty (six variables with highest index of 5 makes the highest Cumulative score 6×5=30) and transforming into percentage.

The HDI score shows that there is a clear difference among the blocks. Kotulpur and Indas are showing highest level of human development. These are the two blocks with lucrative agricultural production (Fig. 9.15). Bankura and Bishnupur have enlisted in the second category. About 50 percent blocks are found to occur in the third category (Table: 9.4).
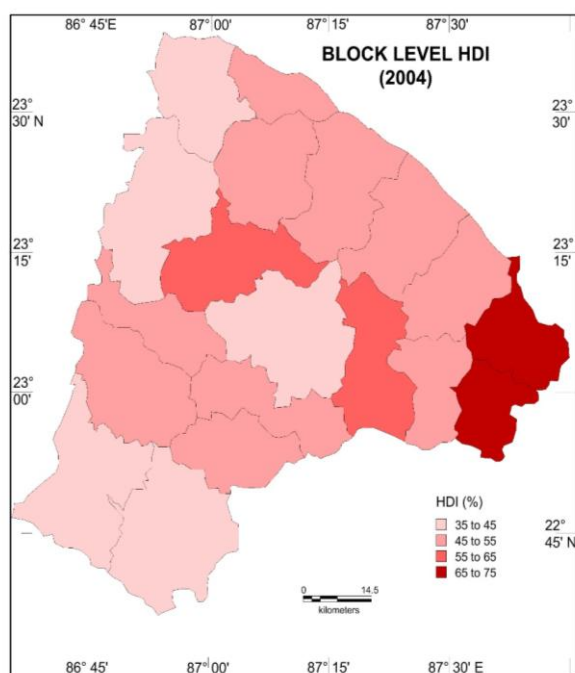
**Fig. 9.15** Block wise Human Development Perspective of Bankura (2004)

About 50 percent blocks are found to occur in the third category with the score 45-55. So theoretically if the highest value is 100, 50 percent of the blocks are showing average level of human development. The blocks within this category are Sonamukhi, Joypur, Taldangra, Barjora, Mejhia, Gangajalghati, Patrasayer, Simlapal and Khatra. Other blocks are very poor in human development with score within the range of 35-45. Those are Ranibandh, Raipur, Indpur, Onda, Chhatna and Saltora.All the six blocks are located at the western margin of the plateau fringe of the district. Therefore all theses six blocks must be give proper emphasis livelihood development first which will enable human development in future. Topography is essentially a barrier for such area where availability of arable land is low and water availability and irrigation intensity are practically impossible for development. In the framework of livelihood development theory (Elis, 2007) natural capital has enough potential in terms of forest and forest product. But that is no more lucrative for livelihood development due to market link failure. Being a common pull resource, its extraction is not within the grip of poor tribal's. Rather traders from general caste are exploiting the poor tribal's for the collection of forest resources and gaining the maximum profit (Ray, A and Guchhait, S.K, 2011). Ray and Guchhait therefore suggest, community

based forest resource development, animal husbandry, poultry farming and especially proper emphasis on MGNREGA for income generation.

## 9.7 Relation between Socio-Economic Development and Human Development

In the earlier phase of this chapter socio- economic development was assesses and now the spatial pattern of human development is extracted. Therefore it is necessary to find out correlation and regression between human development and socio-economic development.



$$y = -0.0001x^3 + 0.0614x^2 - 8.2435x + 395.43$$
$$R^2 = 0.5463$$
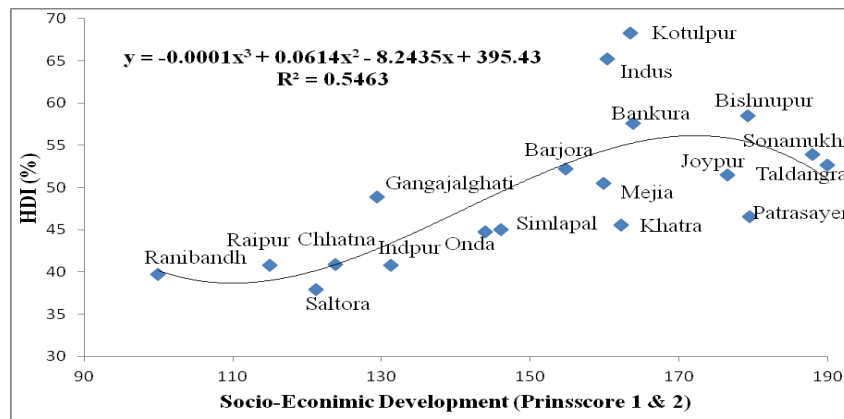
**Source :** Computed from Table 9.4

**Fig: 9.16** Relation between Socio-Economic Development and HDI

The regression and correlation shows that these two parameters are not linearly associated as the highest $R^2$ value that is significant at 99 percent level is (at 17d.f, $t_1=6.19>t_0= 2.57$ at 99% level) achieved through third degree parabola. These parabola shows that weaker initial slope is found for the blocks with low values of socio-economic development and HDI, basically for the west marginal blocks. The rate thereafter accelerates for the blocks with moderate socio-economic development and HDI (Fig: 9.16). It (relation) turns out into reverse slope for the blocks with socio-economic development and HDI. This regression clearly prompts that intense socio-economic development by proper planning may easily lead to better human development for the laggard blocks of western margin, which is utmost necessary.

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## Chapter – 10 : Epilogue

- Essence of Observations

- Critical Findings

- Strategic Points of Observation

- Confirmation of Hypothesis

- Suggestions and Concluding remarks

# *Epilogue*

The research work was started with notion of investigating spatial pattern of demography and its relation with human development. It was initially assumed that the district Bankura, mainly located in the infertile tract of *Rarh* Bengal pronounced with rocky uplands of plateau fringe at the west, lateritic tract with rocky out crop at the middle and east and fertile plain at south-eastern corner has the little scope for agricultural development. Therefore it is ascertained that level of human development based on agricultural economy is not up to the mark (Ray. A. P. 2013). There is a clear dichotomy between the western hill terrain and the rest of the portion, in terms of forest, soil, tribal concentration. As a result either in population growth or in human development index, western portion voices in a lower tune than that of the other areas. But recent time mining and industrialization in the central portion of northern blocks have gained newer momentum in respect of population growth as well as human development. This sort of strategic change has occurred within the last 20-30 years with the introduction of consequence with mining in Mejia, industrialization in Barjora and some portion of Gangajalghati. The south-eastern corner associated with fertile plain is showing mark difference in terms of both population growth and human development. All these realizations are cropped up in the ultimate stage of discussion in the form of **essence of observation, critical findings**, **strategic points and concluding remarks with suggestions.**

## 10.1 Essence of Observations

Essence of observation is the extract of chapter five, six, seven, eight and nine concerning population growth dynamics, spatial pattern of population growth and human development.

Population growth has been analyzed in chapter five and six. It is revealed that the index of growth is not so much alarming but for some blocks it is undoubtedly alarming. It maintains a steady growth for the district, but few blocks are showing moderate to high growth rate of population. Though the growth rate of population has

a declining trend (initially in 1961 it was 26.17% and in 2011 it shows 12.65% only), the threshold is higher for alluvial tract (for Kotulpur, Joypur and Patrasayer), moderate for lateritic tract (for Bishnupur, Joypur, Barjora,Onda, Taldangra and Simlapal) and substantially low for rocky plateau tract (for Ranibandh, Raipur, Khatra and Saltora). In terms of rate of growth of population size, urban and industrial blocks (Bankura, Barjora and Mejia) are showing higher rate while Kotulpur, Indus, Bishnupur, Joypur, Patrasayer are showing moderate response. Density threshold on the other hand is high for the blocks pronounced with urbanization and industrialization and moderately high for the blocks of alluvial tracts. Being located at the plateau tract, Chhatna and Khatra are standing apart with high size threshold, moderate density threshold and moderate rate of growth of density as well as size due to its long historical process of growth.

### 10.1.1 Spatial Variation of Population

Spatial variation of population is depicting diversity in different perspective or factors. In terms of sex composition, male population size threshold is high for the south-eastern blocks while rate of growth of population is high for the blocks pronounced with urbanization and industrialization(for Bankura, Barjora, Mejia, Patrasayer). This is obviously the reason for the migration of male labour force in the non-primary activity where female are discouraged.

On the other hand, growth of caste composition is showing a clear distinction over the space. It is found that average scheduled caste population is high for northern blocks (Saltora, Mejia, Barjora, Gangajalghati, Sonamukhi and Patrasayer), where as concentration of scheduled tribe population growth is high in the western blocks (Ranibandh, Raipur, Khatra, Indpur and Chhatna).

In the perspective of allometric growth, the rate is strong for few blocks only, moderately strong for eastern side blocks, both in terms of size and density allometry. Allometric growth measure reflects a clear cut dichotomy between east and west, almost in sequel to the percentage of arable land. South-eastern most two blocks (Kotulpur and Indus)  are showing very high allometric growth both in size and density, while other eastern blocks with a lower amount of arable land compared to Kotulpur and Indus are also showing positive allometry (Simlapal, Taldangra, Onda, Bishnupur, Joypur, Patrasayer, Sonamukhi, Barjora). Rests of the blocks, located in

the western portion are showing negative allometry. Strikingly, Bankura and Raipur are showing isometric growth both in respect of population size and density, representing equal pace of growth with the system.

### 10.1.2 Human Development

Before articulating human development, the thrust was given to assess socio-economic development through specific indicators of development. Through the PCA analysis of socio-economic development it is revealed that of south-eastern blocks and blocks pronounced with urbanization and industrial activity, are showing high Z-score, western blocks except Bankura and Chhatna are loaded with high value. With the cumulative Z-score of different parameters, the perspective of human development is curved out with the help of the data of District Human Development Report (2004), Bankura. HDI score is generated with weighted measures of each variable of each block in respect of taking the highest score of each variable as 5. Practically, the array of HDI score and the PRIN-score of development perspective are tuning almost at the same level. Therefore a regression is fitted herewith, where the best fit regression is the third order polynomials that conclusively determines the position of the blocks in a four tier level-low, moderate, high and very high.

Primary survey was done at micro level (village level response) collection of data by the responses of the villagers with structured questionnaires in relation to problem of livelihood and human development. It appears that income generation is gradually tending towards non-primary activity apart from the role of MGNREGA. Health and educational awareness are better for the villages with access to school and health centers. Therefore the people of the villages very close to the road side are showing better awareness about the health and education. But real livelihood development which in another way turns out into human development is related to the implementation of the different Government schemes related to human welfare as revealed through the responses from the villagers of nine villages under study.

## 10.2 Critical Findings

At the penultimate stage of the thesis, it is necessary to crop up the critical finding about the population growth and human development of the district within the time frame of 1951to 2011. The whole findings are encapsulated under three heads,

viz.-nature of population growth, spatial pattern of population growth and human development.

**10.2.1 Nature of Population Growth**

In term of nature of population growth the district as a whole and most of the blocks are showing steady decline of population growth with few exceptions for some blocks in 1981 and 2001. The blocks of Ranibandh, Khatra, Chhatna and Indpur with huge concentration of tribes are showing low growth rate within this period and slower rate of decrease compared to other blocks. For other blocks the initial growth rate (1961) has come down to half, more than half and even one third of the end point(2011). For the blocks of transitional plain like Kotulpur, Indus and plain-plateau transitional block of Bishnupur and Joypur have come down to more than one third and sometime very close to one forth of initial growth rate (1951).

**10.2.2 Spatial Pattern of Population Size, Density and Composition**

Spatial pattern of size and density are clearly depicting three tier division-blocks with high threshold and high rate of growth signifying huge growth of population in future; blocks with moderate threshold and moderate growth rate prompting steady growth in future. Bankura block with dominant can be singled out as the block with high threshold and high rate of growth, where as Ranibandh, Mejhia, Taldangra and Simlapal are showing low threshold and low growth rate. All other blocks are showing moderate threshold and moderate growth rate for population size. Density reflects almost the same but for low threshold and low growth rate; Indpur and Indas are added with this list.

In terms of composition of population, the district and the blocks except the Bankura and Bishnupur are overwhelmed with rural population. But more alarming is the steady decline of sex-ratio of all the blocks which is not an exceptional scenario, but the general picture of West Bengal and India. In terms of percentage of Caste composition, all the three categories of population over the blocks remain almost same throughout the period of observation. But scheduled tribe concentration is high in the western block and relatively low concentration of scheduled caste population. Ranibandh, Raipur, Khatra, Chhatna and Saltora has very high concentration of scheduled tribe population over 20 percent (Saltora is very close to 20percentage).

Scheduled caste population is spread out throughout the blocks within the range of 20 to 40 percent with exception of Ranibandh.

### 10.2.3 Human Development

Human development perspective of the blocks are tuning at the same scale as it is found for growth perspective and composition of the population. Blocks of the plain-plateau transition like Kutulpur, Indus, Bishnupur, Sonamukhi and urban blocks of Bankura are showing high index under the consider parameter, whereas Ranibandh, Raipur, Khatra, Indpur and Chhatna are loaded with low index. Other blocks are showing moderate value.

## 10.3 Strategic Points of Observation

Throughout the enquiry of population growth, spatial pattern of population dynamics and human development , it is observed that Ranibandh is the most laggard block because of its rocky terrain, forest cover, tribal concentration and non-availability of arable land. Thereby it is showing low population growth and human development. Ranibandh, Raipur, Khatra and Chhatna are tuning in the same voice but with little better growth of population and human development. Kotulpur and Indas being located in the fertile tract coupled with Bankura and Bishnupur for their urban function showing higher population growth and better human development. Other blocks are showing moderate in population growth and human development due to their non-urban function as well as non-lucrative agrarian economy.

## 10.4 Confirmation of Hypothesis

Initial hypothesis was built up in the form of '*spatial mosaic of population growth and human development varies not only in accordance with topographic sequence of north-west to south-east conditioned by soil fertility, arable land but also socio-economic status of the blocks*'.

After the entire investigation the thesis is not absolutely confirmed. It is true that in general idea variations of population growth and human development vary in accordance with topographic sequence of north-west to south-east, but particularly urban dominated block of Bankura and urban function of Bishnupur are diluting this trend to some extent.

## 10.5 Suggestions and Concluding remarks

At the end stage of this enquiry it can be concluded that population growth of four blocks of Bankura District are high enough (Kotulpur, Bankura, Indas and Barjora). For other blocks, it is not so alarming I terms of size and density. In terms of socio-economic development through PCA a clear dichotomy between east and west is clear. And about the variables taken into consideration, agriculture variables like arable land and irrigation are being marginalized. Therefore society need development in non agricultural sector which is gradually going to be established in the northern blocks like Mejhia, Brajora, Saltora with the introduction of mining and industries.

In the concluding paragraph it must be clearly specify that Ranibandh, Raipur, Indpur, Saltora and Khatra must be given emphasis especially in terms of gross output, sanitation that is reflected by the investigation of HDI in the present enquiry. It is very difficult to increase gross output by agriculture or industry. Forest resource has some potential but its prospect is not at all high and moderate. Therefore, employment generation, through MGNREGA and water shed planning (Madal, P. 2012) by proper development plan may be the alternative by which east-west dichotomy may to a considerable extent be avoided.

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# *Appendix – A*

## *Databases*

**Appendix - I**

**Decadal Growth Rate of Population of Bankura District (1951-2011)**

| Blocks | 1951-61 | 1961-71 | 1971-81 | 1981-91 | 1991-2001 | 2001-11 |
|---|---|---|---|---|---|---|
| Bankura | 24.6 | 24.59 | 17.17 | 18.77 | 13.57 | 10.89 |
| Onda | 29.57 | 19.69 | 22.26 | 18.8 | 15.44 | 14.69 |
| Chhatna | 14.92 | 17.08 | 12.42 | 15.75 | 8.37 | 15.26 |
| Gangajalghati | 26.19 | 19.82 | 16.57 | 15.05 | 12.82 | 11.71 |
| Barjora | 31.48 | 24.33 | 18.88 | 17.21 | 12.54 | 12.87 |
| Mejia | 22.78 | 20.73 | 21.63 | 12.81 | 9.86 | 13.22 |
| Saltora | 19.28 | 18.85 | 12.68 | 17.1 | 9.58 | 11.87 |
| Khatra | 20.84 | 14.79 | 13.36 | 14.77 | 15.46 | 14.73 |
| Indpur | 19.38 | 21.36 | 12.9 | 21.27 | 10.17 | 13.57 |
| Ranibandh | 15.13 | 15.75 | 7.55 | 13.07 | 11.28 | 14.15 |
| Raipur | 14.66 | 29.21 | 13.23 | 16.96 | 14.15 | 12.89 |
| Simlapal | 22.49 | 23.11 | 22.86 | 20.68 | 14.5 | 12.24 |
| Taldangra | 21.27 | 24.68 | 21.41 | 19.81 | 15.39 | 14.87 |
| Bishnupur | 37.3 | 13.81 | 22.94 | 21.01 | 17.09 | 11.9 |
| Joypur | 35.56 | 22.03 | 18.27 | 19.18 | 15.9 | 10.9 |
| Kotulpur | 43.38 | 28.81 | 20.14 | 19.79 | 15.93 | 12.67 |
| Sonamukhi | 34.77 | 28.16 | 16.31 | 20.42 | 14.41 | 10.67 |
| Patrasayer | 36.85 | 19.29 | 16.36 | 21.46 | 16.69 | 12.2 |
| Indus | 43.3 | 30.96 | 17.25 | 9.54 | 23.92 | 11.08 |

**Appendix II**
**Block-wise Absolute Size of Population of Bankura District (1951-2011)**

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Bankura | 141850 | 176746 | 220213 | 258014 | 306454 | 348036 | 385935 |
| Onda | 84829 | 109913 | 131552 | 160838 | 191078 | 220572 | 252984 |
| Chhatna | 89182 | 102488 | 119994 | 134900 | 156147 | 169215 | 195038 |
| Gangajalhati | 70817 | 89366 | 107075 | 124814 | 143595 | 162007 | 180974 |
| Barjora | 69831 | 91817 | 114154 | 135703 | 159060 | 179007 | 202049 |
| Mejia | 34068 | 41827 | 50499 | 61424 | 69294 | 76123 | 86188 |
| Saltora | 59304 | 70736 | 84073 | 94734 | 110929 | 121552 | 135980 |
| Khatra | 84020 | 101529 | 116550 | 132121 | 151630 | 175071 | 200864 |
| Indpur | 63069 | 75292 | 91374 | 103162 | 125106 | 137825 | 156522 |
| Ranibandh | 57850 | 66604 | 77094 | 82911 | 93748 | 104326 | 119089 |
| Raipur | 110028 | 126157 | 163009 | 184574 | 215870 | 246421 | 278185 |
| Simlapal | 49782 | 60978 | 75068 | 92232 | 111308 | 127445 | 143038 |
| Taldangra | 50733 | 61525 | 76709 | 93129 | 111573 | 128747 | 147893 |
| Bishnupur | 73741 | 101243 | 115224 | 141652 | 171414 | 200715 | 224605 |
| Joypur | 52359 | 70980 | 86614 | 102435 | 122082 | 141497 | 156920 |
| Kotulpur | 54374 | 77960 | 100424 | 120652 | 144528 | 167547 | 188775 |
| Sonamukhi | 61307 | 82624 | 105890 | 123156 | 148308 | 169682 | 187782 |
| Patrasayer | 60940 | 83396 | 99486 | 115758 | 140600 | 164060 | 184070 |
| Indus | 51175 | 73332 | 96037 | 112606 | 123344 | 152847 | 169783 |

**Appendix III**

**Block Wise Decadal Sex Ratio from 1951-2011**

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Bankura | 949 | 955 | 945 | 946 | 943 | 946 | 957 |
| Onda | 979 | 990 | 967 | 968 | 958 | 954 | 957 |
| Chhatna | 1000 | 984 | 974 | 975 | 963 | 975 | 960 |
| Gangajalhati | 999 | 998 | 970 | 965 | 946 | 949 | 941 |
| Barjora | 995 | 988 | 964 | 954 | 944 | 938 | 947 |
| Mejia | 962 | 960 | 947 | 942 | 929 | 926 | 934 |
| Saltora | 997 | 988 | 964 | 950 | 950 | 953 | 950 |
| Khatra | 986 | 959 | 942 | 955 | 941 | 951 | 951 |
| Indpur | 978 | 968 | 935 | 960 | 928 | 941 | 943 |
| Ranibandh | 1004 | 957 | 952 | 959 | 949 | 962 | 975 |
| Raipur | 989 | 969 | 952 | 965 | 957 | 958 | 966 |
| Simlapal | 961 | 950 | 921 | 956 | 953 | 952 | 959 |
| Taldangra | 981 | 980 | 950 | 974 | 959 | 959 | 972 |
| Bishnupur | 1030 | 980 | 970 | 970 | 959 | 960 | 970 |
| Joypur | 1013 | 1006 | 973 | 986 | 963 | 956 | 958 |
| Kotulpur | 958 | 1001 | 966 | 976 | 952 | 940 | 958 |
| Sonamukhi | 921 | 1004 | 963 | 975 | 951 | 945 | 944 |
| Patrasayer | 971 | 1004 | 980 | 988 | 970 | 964 | 966 |
| Indus | 980 | 1005 | 965 | 971 | 953 | 951 | 958 |
| Dist.bankura | 981 | 981 | 958 | 964 | 951 | 951 | 957 |

**Appendix IV**
**Block wise Decadal Density of Bankura District (1951-2011)**

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Bankura | 347 | 433 | 539 | 632 | 750 | 852 | 939 |
| Onda | 169 | 219 | 262 | 320 | 380 | 439 | 504 |
| Chhatna | 199 | 229 | 268 | 301 | 354 | 378 | 436 |
| Gangajalhati | 191 | 241 | 288 | 336 | 387 | 442 | 494 |
| Barjora | 176 | 233 | 290 | 345 | 404 | 455 | 514 |
| Mejia | 209 | 257 | 310 | 377 | 425 | 467 | 529 |
| Saltora | 188 | 225 | 267 | 301 | 350 | 389 | 434 |
| Khatra | 195 | 235 | 270 | 306 | 316 | 414 | 475 |
| Indpur | 210 | 251 | 305 | 344 | 417 | 455 | 517 |
| Ranibandh | 135 | 155 | 180 | 194 | 219 | 243 | 278 |
| Raipur | 187 | 214 | 277 | 314 | 364 | 415 | 468 |
| Simlapal | 161 | 197 | 243 | 298 | 360 | 412 | 461 |
| Taldangra | 145 | 176 | 219 | 266 | 319 | 368 | 423 |
| Bishnupur | 194 | 267 | 304 | 373 | 414 | 529 | 579 |
| Joypur | 200 | 272 | 331 | 392 | 465 | 536 | 594 |
| Kotulpur | 217 | 311 | 401 | 482 | 577 | 669 | 755 |
| Sonamukhi | 161 | 217 | 279 | 324 | 390 | 447 | 480 |
| Patrasayer | 189 | 259 | 309 | 360 | 437 | 509 | 570 |
| Indus | 227 | 287 | 376 | 441 | 487 | 599 | 666 |
| Dist.Bankura | 192 | 243 | 295 | 345 | 390 | 432 | 523 |

**Appendix V**
**Block-wise Decadal Male Population of the Bankura District (1951-2011)**

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Bankura | 72772 | 90424 | 113236 | 132582 | 157750 | 178842 | 197224 |
| Onda | 42874 | 55221 | 66890 | 81741 | 97576 | 112875 | 129248 |
| Chhatna | 44591 | 51506 | 60779 | 68312 | 79550 | 85669 | 99523 |
| Gangajalhati | 35421 | 44719 | 54343 | 63522 | 73774 | 83117 | 93252 |
| Barjora | 35000 | 46181 | 58122 | 69462 | 81809 | 92368 | 110972 |
| Mejia | 17363 | 21342 | 25943 | 31627 | 35921 | 39525 | 44575 |
| Saltora | 29694 | 35579 | 42799 | 48572 | 56891 | 62239 | 69732 |
| Khatra | 42296 | 51837 | 60004 | 67592 | 78123 | 89864 | 106749 |
| Indpur | 31885 | 38251 | 47214 | 52627 | 64897 | 70990 | 80556 |
| Ranibandh | 28866 | 34036 | 39503 | 42317 | 48095 | 53168 | 60290 |
| Raipur | 55307 | 64084 | 83503 | 93940 | 110316 | 126011 | 141507 |
| Simlapal | 25385 | 31278 | 39084 | 47161 | 56986 | 65297 | 73008 |
| Taldangra | 25612 | 31072 | 39340 | 47181 | 56955 | 65713 | 74999 |
| Bishnupur | 36322 | 51130 | 58483 | 71909 | 87506 | 102423 | 113996 |
| Joypur | 26013 | 35379 | 43892 | 51590 | 62204 | 72348 | 80138 |
| Kotulpur | 27768 | 38970 | 51081 | 61051 | 74035 | 86385 | 96394 |
| Sonamukhi | 31921 | 41237 | 53947 | 62344 | 76013 | 87247 | 96598 |
| Patrasayer | 30912 | 41611 | 50241 | 58219 | 71337 | 83517 | 93614 |
| Indus | 25851 | 36566 | 48863 | 57118 | 67777 | 78404 | 86697 |
| Dist.Bankura | 665853 | 840423 | 1E+06 | 1208867 | 1437515 | 1524324 | 1838095 |

**Appendix VI**
**Block-wise Decadal Female Population of the Bankura District (1951-2011)**

| Blocks | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|---|
| Bankura | 69078 | 86322 | 106977 | 125432 | 148704 | 169194 | 188711 |
| Onda | 41955 | 54692 | 64662 | 79097 | 93502 | 107697 | 123736 |
| Chhatna | 44591 | 50982 | 59215 | 66588 | 76597 | 83546 | 95515 |
| Gangajalhati | 35396 | 44647 | 52732 | 61292 | 69821 | 78890 | 87722 |
| Barjora | 34831 | 45636 | 56032 | 66241 | 77251 | 86639 | 105089 |
| Mejia | 16705 | 20485 | 24556 | 29797 | 33373 | 36598 | 41613 |
| Saltora | 29610 | 35157 | 41274 | 46162 | 54038 | 59313 | 66248 |
| Khatra | 41724 | 49692 | 56546 | 64529 | 73507 | 85207 | 101497 |
| Indpur | 31184 | 37041 | 44160 | 50535 | 60209 | 66835 | 75966 |
| Ranibandh | 28984 | 32568 | 37591 | 40594 | 45653 | 51158 | 58799 |
| Raipur | 54721 | 62073 | 79506 | 90634 | 105554 | 120410 | 136678 |
| Simlapal | 24397 | 29700 | 35984 | 45071 | 54322 | 62148 | 70030 |
| Taldangra | 25121 | 30453 | 37369 | 45948 | 54618 | 63034 | 72894 |
| Bishnupur | 37419 | 50113 | 56741 | 69743 | 83908 | 98292 | 110609 |
| Joypur | 26346 | 35601 | 42722 | 50845 | 59878 | 64149 | 76782 |
| Kotulpur | 26606 | 38990 | 49343 | 59601 | 70493 | 81162 | 92381 |
| Sonamukhi | 29386 | 41387 | 51943 | 60812 | 72292 | 82435 | 91184 |
| Patrasayer | 30028 | 41785 | 49245 | 57539 | 69263 | 80543 | 90456 |
| Indus | 25324 | 36766 | 47174 | 55488 | 64567 | 74443 | 83086 |
| Dist.Bankura | 653406 | 824090 | 993772 | 1165948 | 1367550 | 1450289 | 1758579 |

**Appendix VII**

**Block wise Decadal Scheduled Tribe Population of Bankura District (1961-2011)**

| Blocks | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|---|---|---|---|---|---|---|
| Bankura | 4852 | 6264 | 7463 | 7671 | 10882 | 11146 |
| Onda | 5785 | 6287 | 7269 | 8705 | 10553 | 11443 |
| Chhatna | 22935 | 26292 | 30411 | 34556 | 36919 | 39975 |
| Gangajalhati | 3767 | 3630 | 4361 | 5531 | 6576 | 7160 |
| Barjora | 1411 | 1345 | 1948 | 2722 | 3221 | 3359 |
| Mejia | 570 | 899 | 1054 | 1695 | 1684 | 2114 |
| Saltora | 13858 | 15728 | 17470 | 20205 | 23111 | 25696 |
| Khatra | 23531 | 26045 | 33096 | 38438 | 43503 | 49761 |
| Indpur | 5274 | 8727 | 9790 | 11606 | 13505 | 15003 |
| Ranibandh | 27580 | 35354 | 40820 | 44833 | 49321 | 56061 |
| Raipur | 31660 | 40377 | 50214 | 54352 | 61960 | 67805 |
| Simlapal | 8817 | 10448 | 13624 | 17297 | 18890 | 21277 |
| Taldangra | 8781 | 10502 | 12993 | 15619 | 17848 | 20597 |
| Bishnupur | 5217 | 6251 | 7160 | 8240 | 10981 | 12410 |
| Joypur | 1247 | 1442 | 1754 | 2127 | 3095 | 3210 |
| Kotulpur | 1910 | 2463 | 3231 | 4255 | 5550 | 6262 |
| Sonamukhi | 3093 | 2647 | 3383 | 3968 | 5426 | 6013 |
| Patrasayer | 1926 | 2403 | 2946 | 3798 | 4856 | 5533 |
| Indus | 1175 | 1631 | 1594 | 2285 | 2902 | 3143 |

**Appendix VIII**
**Block-wise Decadal Scheduled Caste Population of Bankura District (1961-2011)**

| Blocks | 1961 | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|---|
| Bankura | 50758 | 58804 | 72535 | 62429 | 100297 |
| Onda | 36395 | 38723 | 49313 | 62480 | 71621 |
| Chhatna | 26357 | 31563 | 34386 | 42985 | 46325 |
| Gangajalhati | 30488 | 35577 | 41034 | 48811 | 54510 |
| Barjora | 26375 | 33434 | 40272 | 50783 | 58119 |
| Mejia | 13925 | 15180 | 18944 | 22886 | 25032 |
| Saltora | 22199 | 24757 | 29854 | 36878 | 40856 |
| Khatra | 26058 | 33148 | 31246 | 38925 | 43181 |
| Indpur | 29193 | 31217 | 38292 | 49080 | 52613 |
| Ranibandh | 8929 | 11235 | 8997 | 10595 | 11730 |
| Raipur | 26682 | 35447 | 40055 | 50617 | 57811 |
| Simlapal | 14303 | 13611 | 20753 | 27787 | 31831 |
| Taldangra | 15926 | 19462 | 21097 | 27394 | 30556 |
| Bishnupur | 31328 | 32128 | 37126 | 37400 | 58812 |
| Joypur | 23313 | 23033 | 32299 | 45219 | 53175 |
| Kotulpur | 21982 | 27445 | 35755 | 49201 | 57599 |
| Sonamukhi | 28225 | 33876 | 45774 | 51722 | 66171 |
| Patrasayer | 33783 | 39014 | 44636 | 62604 | 73331 |
| Indus | 27485 | 35508 | 43932 | 54679 | 63838 |

**Appendix IX**

**Block-wise Decadal Population other than Scheduled Caste and Scheduled Tribe of Bankura District (1961-2011)**

| Blocks | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 |
|--------|------|------|------|------|------|------|
| Bankura | 121136 | 155145 | 178016 | 236354 | 236857 | 262386 |
| Onda | 67733 | 86542 | 104256 | 119893 | 138398 | 157608 |
| Chhatna | 53196 | 62139 | 70103 | 78606 | 85971 | 96570 |
| Gangajalhati | 55111 | 67868 | 79419 | 89253 | 100921 | 109982 |
| Barjora | 64031 | 79375 | 93483 | 105555 | 117667 | 126836 |
| Mejia | 27332 | 34420 | 41420 | 44713 | 49407 | 54118 |
| Saltora | 34679 | 43588 | 47410 | 53846 | 57585 | 63787 |
| Khatra | 51940 | 57357 | 67779 | 74267 | 88387 | 95206 |
| Indpur | 40825 | 51430 | 55080 | 64420 | 71707 | 77987 |
| Ranibandh | 30095 | 30505 | 33094 | 38320 | 43275 | 49387 |
| Raipur | 67815 | 87185 | 94305 | 110901 | 126650 | 141729 |
| Simlapal | 37858 | 51009 | 57855 | 66224 | 76724 | 84023 |
| Taldangra | 36818 | 46745 | 59039 | 68560 | 80343 | 88393 |
| Bishnupur | 64698 | 76845 | 97366 | 125774 | 130922 | 141435 |
| Joypur | 46420 | 62139 | 68382 | 74736 | 85227 | 92705 |
| Kotulpur | 54068 | 70516 | 81666 | 91072 | 104398 | 113534 |
| Sonamukhi | 51306 | 69367 | 73999 | 92618 | 98085 | 105387 |
| Patrasayer | 47687 | 58069 | 68176 | 74198 | 85873 | 93036 |
| Indus | 44672 | 58898 | 67080 | 66380 | 86107 | 92359 |

**Appendix X**
**Absolute Size Coefficient of Variation (C.V.) of Bankura District**

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | S.D. | C.V. |
|---|---|---|---|---|---|---|---|---|---|
| Bankura | 141850 | 176746 | 220213 | 258014 | 306454 | 348036 | 385935 | 89361 | 34.15 |
| Onda | 84829 | 109913 | 131552 | 160838 | 191078 | 220572 | 252984 | 56196 | 34.2 |
| Chhatna | 89182 | 102488 | 119994 | 134900 | 156147 | 169215 | 195038 | 34918 | 25.3 |
| Gangajalhati | 70817 | 89366 | 107075 | 124814 | 143595 | 162007 | 180974 | 36593 | 29.2 |
| Barjora | 69831 | 91817 | 114154 | 135703 | 159060 | 179007 | 202049 | 43999 | 32.4 |
| Mejia | 34068 | 41827 | 50499 | 61424 | 69294 | 76123 | 86188 | 17432 | 29.1 |
| Saltora | 59304 | 70736 | 84073 | 94734 | 110929 | 121552 | 135980 | 25632 | 26.5 |
| Khatra | 84020 | 101529 | 116550 | 132121 | 151630 | 175071 | 200864 | 38262 | 27.8 |
| Indpur | 63069 | 75292 | 91374 | 103162 | 125106 | 137825 | 156522 | 31449 | 29.3 |
| Ranibandh | 57850 | 66604 | 77094 | 82911 | 93748 | 104326 | 119089 | 19814 | 23.1 |
| Raipur | 110028 | 126157 | 163009 | 184574 | 215870 | 246421 | 278185 | 57140 | 30.2 |
| Simlapal | 49782 | 60978 | 75068 | 92232 | 111308 | 127445 | 143038 | 32137 | 34.1 |
| Taldangra | 50733 | 61525 | 76709 | 93129 | 111573 | 128747 | 147893 | 33005 | 34.5 |
| Bishnupur | 73741 | 101243 | 115224 | 141652 | 171414 | 200715 | 224605 | 50713 | 34.5 |
| Joypur | 52359 | 70980 | 86614 | 102435 | 122082 | 141497 | 156920 | 35035 | 33.5 |
| Kotulpur | 54374 | 77960 | 100424 | 120652 | 144528 | 167547 | 188775 | 44755 | 36.7 |
| Sonamukhi | 61307 | 82624 | 105890 | 123156 | 148308 | 169682 | 187782 | 42595 | 33.9 |
| Patrasayer | 60940 | 83396 | 99486 | 115758 | 140600 | 164060 | 184070 | 40931 | 33.8 |
| Indus | 51175 | 73332 | 96037 | 112606 | 123344 | 152847 | 169783 | 38882 | 34.9 |

**Absolute Density Coefficient of Variation (C.V.) of Bankura**

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | C.V |
|---|---|---|---|---|---|---|---|---|
| Bankura | 347 | 433 | 539 | 632 | 750 | 852 | 939 | 31.46 |
| Onda | 169 | 219 | 262 | 320 | 380 | 439 | 504 | 36.29 |
| Chhatna | 199 | 229 | 268 | 301 | 354 | 378 | 436 | 25.39 |
| Gangajalhati | 191 | 241 | 288 | 336 | 387 | 442 | 494 | 29.64 |
| Barjora | 176 | 233 | 290 | 345 | 404 | 455 | 514 | 32.52 |
| Mejia | 209 | 257 | 310 | 377 | 425 | 467 | 529 | 29.08 |
| Saltora | 188 | 225 | 267 | 301 | 350 | 389 | 434 | 26.69 |
| Khatra | 195 | 235 | 270 | 306 | 316 | 414 | 475 | 28.89 |
| Indpur | 210 | 251 | 305 | 344 | 417 | 455 | 517 | 28.9 |
| Ranibandh | 135 | 155 | 180 | 194 | 219 | 243 | 278 | 23.06 |
| Raipur | 187 | 214 | 277 | 314 | 364 | 415 | 468 | 29.82 |
| Simlapal | 161 | 197 | 243 | 298 | 360 | 412 | 461 | 34.01 |
| Taldangra | 145 | 176 | 219 | 266 | 319 | 368 | 423 | 34.49 |
| Bishnupur | 194 | 267 | 304 | 373 | 414 | 529 | 579 | 33.9 |
| Joypur | 200 | 272 | 331 | 392 | 465 | 536 | 594 | 33.06 |
| Kotulpur | 217 | 311 | 401 | 482 | 577 | 669 | 755 | 33.84 |
| Sonamukhi | 161 | 217 | 279 | 324 | 390 | 447 | 480 | 33.32 |
| Patrasayer | 189 | 259 | 309 | 360 | 437 | 509 | 570 | 33.69 |
| Indus | 227 | 287 | 376 | 441 | 487 | 599 | 666 | 33.4 |
| Dist.Bankura | 192 | 243 | 295 | 345 | 390 | 432 | 523 | 30.45 |

## Appendix XII

### Size Allometry of  Bankura District (1951-2011)

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | y=ax$^b$ | Relative Growth Rate |
|---|---|---|---|---|---|---|---|---|---|
| Bankura | 141850 | 176746 | 220213 | 258014 | 306454 | 348036 | 385935 | 1.02194 | 172.07 |
| Onda | 84829 | 109913 | 131552 | 160838 | 191078 | 220572 | 252984 | 1.0968 | 198.23 |
| Chhatna | 89182 | 102488 | 119994 | 134900 | 156147 | 169215 | 195038 | 0.78158 | 118.7 |
| Gangajalhati | 70817 | 89366 | 107075 | 124814 | 143595 | 162007 | 180974 | 0.9378 | 155.55 |
| Barjora | 69831 | 91817 | 114154 | 135703 | 159060 | 179007 | 202049 | 1.06181 | 189.34 |
| Mejia | 34068 | 41827 | 50499 | 61424 | 69294 | 76123 | 86188 | 0.93778 | 152.99 |
| Saltora | 59304 | 70736 | 84073 | 94734 | 110929 | 121552 | 135980 | 0.83663 | 129.29 |
| Khatra | 84020 | 101529 | 116550 | 132121 | 151630 | 175071 | 200864 | 0.85834 | 139.07 |
| Indpur | 63069 | 75292 | 91374 | 103162 | 125106 | 137825 | 156522 | 0.92169 | 148.18 |
| Ranibandh | 57850 | 66604 | 77094 | 82911 | 93748 | 104326 | 119089 | 0.70498 | 105.86 |
| Raipur | 110028 | 126157 | 163009 | 184574 | 215870 | 246421 | 278185 | 0.95585 | 152.83 |
| Simlapal | 49782 | 60978 | 75068 | 92232 | 111308 | 127445 | 143038 | 1.09288 | 187.33 |
| Taldangra | 50733 | 61525 | 76709 | 93129 | 111573 | 128747 | 147893 | 1.09744 | 191.51 |
| Bishnupur | 73741 | 101243 | 115224 | 141652 | 171414 | 200715 | 224605 | 1.1114 | 204.59 |
| Joypur | 52359 | 70980 | 86614 | 102435 | 122082 | 141497 | 156920 | 1.0966 | 199.7 |
| Kotulpur | 54374 | 77960 | 100424 | 120652 | 144528 | 167547 | 188775 | 1.23515 | 247.18 |
| Sonamukhi | 61307 | 82624 | 105890 | 123156 | 148308 | 169682 | 187782 | 1.12486 | 206.3 |
| Patrasayer | 60940 | 83396 | 99486 | 115758 | 140600 | 164060 | 184070 | 1.09401 | 202.05 |
| Indus | 51175 | 73332 | 96037 | 112606 | 123344 | 152847 | 169783 | 1.17115 | 231.77 |

## Appendix XIII

## Data Base for Density Allometry (Y=a X$^{b}$)

| BLOCKS | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | a | b |
|---|---|---|---|---|---|---|---|---|---|
| Bankura | 347 | 433 | 539 | 632 | 750 | 852 | 939 | 1.39 | 1.02 |
| Onda | 169 | 219 | 262 | 320 | 380 | 439 | 504 | 0.44 | 1.09 |
| Chhatna | 199 | 229 | 268 | 301 | 354 | 378 | 436 | 2.7 | 0.78 |
| Gangajalhati | 191 | 241 | 288 | 336 | 387 | 442 | 494 | 1.11 | 0.95 |
| Barjora | 176 | 233 | 290 | 345 | 404 | 455 | 514 | 0.55 | 1.07 |
| Mejia | 209 | 257 | 310 | 377 | 425 | 467 | 529 | 1.29 | 0.93 |
| Saltora | 188 | 225 | 267 | 301 | 350 | 389 | 434 | 1.93 | 0.84 |
| Khatra | 195 | 235 | 270 | 306 | 316 | 414 | 475 | 1.2 | 0.85 |
| Indpur | 210 | 251 | 305 | 344 | 417 | 455 | 517 | 1.46 | 0.91 |
| Ranibandh | 135 | 155 | 180 | 194 | 219 | 243 | 278 | 2.86 | 0.7 |
| Raipur | 187 | 214 | 277 | 314 | 364 | 415 | 468 | 1.08 | 0.94 |
| Simlapal | 161 | 197 | 243 | 298 | 360 | 412 | 461 | 0.43 | 1.09 |
| Taldangra | 145 | 176 | 219 | 266 | 319 | 368 | 423 | 0.37 | 1.1 |
| Bishnupur | 194 | 267 | 304 | 373 | 414 | 529 | 579 | 0.57 | 1.08 |
| Joypur | 200 | 272 | 331 | 392 | 465 | 536 | 594 | 0.57 | 1.08 |
| Kotulpur | 217 | 311 | 401 | 482 | 577 | 669 | 755 | 0.28 | 1.23 |
| Sonamukhi | 161 | 217 | 279 | 324 | 390 | 447 | 480 | 0.41 | 0.98 |
| Patrasayer | 189 | 259 | 309 | 360 | 437 | 509 | 570 | 0.52 | 1.09 |
| Indus | 227 | 287 | 376 | 441 | 487 | 599 | 666 | 0.64 | 1.08 |
| Bankura District | 192 | 243 | 295 | 345 | 290 | 464 | 523 | | |

**Appendix XIV**

**Area-Population Relationship**

| BLOCKS | 1951 | | 1981 | | 2011 | |
|---|---|---|---|---|---|---|
| | a | b | a | b | a | b |
| Bankura | 15.979*.6309 | 0.268 | 12.394*.8204 | 0.4919 | 16.143*.8173 | 0.5659 |
| Onda | 8.1934*.7545 | 0.406 | 15.968*.7507 | 0.3514 | 13.379*.8549 | 0.5173 |
| Chhatna | 6.5389*.7712 | 0.492 | 26.849*.6192 | 0.3388 | 15.392*.78 | 0.5521 |
| Gangajalhati | 9.7699*.7284 | 0.647 | 13.1390*.7801 | 0.7068 | 16.995*.7974 | 0.7372 |
| Barjora | 14.437*.6751 | 0.299 | 32.719*.6137 | 0.3757 | 13.557*.8512 | 0.6333 |
| Mejia | 6.9205*.7889 | 0.619 | 11.44*.8174 | 0.6561 | 13.259*.8483 | 0.6725 |
| Saltora | 30.909*.5081 | 0.218 | 22.822*.6701 | 0.4298 | 22.089*.7599 | 0.4835 |
| Khatra | 58.164*.3531 | 0.088 | 33.76*.5723 | 0.2486 | 44.561*.5857 | 0.2252 |
| Indpur | 5.7926*.8213 | 0.442 | 14.141*.7571 | 0.3399 | 11.068*.888 | 0.5458 |
| Ranibandh | 13.631*.6314 | 0.284 | 91.957*.3769 | 0.1514 | 118.11*.3996 | 0.1946 |
| Raipur | 35.484*.4547 | 0.226 | 30.408*.6141 | 0.3777 | 34.93*.6369 | 0.4439 |
| Simlapal | 15.049*.6052 | 0.279 | 44.229*.5255 | 0.2199 | 57.855*.5377 | 0.2648 |
| Taldangra | 22.242*.5708 | 0.273 | 11.691*.8230 | 0.4474 | 35.19*.6664 | 0.3344 |
| Bishnupur | 11.953*.6792 | 0.317 | 13.189*.7911 | 0.4546 | 34.93*.6653 | 0.4118 |
| Joypur | 24.594*.5192 | 0.227 | 5.1544*1.0073 | 0.61 | 8.4079*.982 | 0.6447 |
| Kotulpur | 16.311*.5914 | 0.187 | 7.1258*.9348 | 0.465 | 15.051*.8434 | 0.5724 |
| Sonamukhi | 27.604*.5107 | 0.178 | 23.343*.6903 | 0.3626 | 33.457*.6913 | 0.3995 |
| Patrasayer | 8.6991*.7537 | 0.377 | 20.643*.7013 | 0.3777 | 29.879*.709 | 0.5215 |
| Indus | 21.395*.5908 | 0.301 | 25.146*.6786 | 0.4897 | 30.64*.717 | 0.5276 |

## Appendix XV

### Variables for estimating socio-economic development (1981) of blocks of Bankura district

| BLOCKS | %of irrigated area | %of arable land | Number of village served by 100 primary school | Number ofvillages served by 100 health centers | Number of electrified village | % literacy |
|---|---|---|---|---|---|---|
| Bankura | 46.61 | 77.43 | 62 | 7 | 37 | 45.08 |
| Onda | 66.09 | 80.02 | 69 | 8 | 27 | 35.58 |
| Chhatna | 27.07 | 69.1 | 70 | 32 | 19 | 34.43 |
| Gangajalhati | 52.6 | 87.37 | 79 | 4 | 24 | 35.58 |
| Barjora | 54.5 | 75.78 | 69 | 3 | 18 | 38.57 |
| Mejia | 37.68 | 75.14 | 71 | 14 | 14 | 33.02 |
| Saltora | 31.77 | 75.08 | 71 | 6 | 2 | 28.54 |
| Khatra | 60.96 | 77.42 | 64 | 2 | 6 | 32.77 |
| Indpur | 48.21 | 80.88 | 70 | 3 | 2 | 35.16 |
| Ranibandh | 56.48 | 86.39 | 75 | 4 | 2 | 28.78 |
| Raipur | 83.23 | 67.32 | 67 | 3 | 1 | 54.54 |
| Simlapal | 90 | 77.59 | 68 | 11 | 4 | 49.89 |
| Taldangra | 83.85 | 80.35 | 84 | 9 | 8 | 38.21 |
| Bishnupur | 71.13 | 86.34 | 10 | 3 | 16 | 36.87 |
| Joypur | 95.67 | 89.16 | 80 | 8 | 7 | 36.35 |
| Kotulpur | 73.78 | 88.31 | 66 | 16 | 21 | 40.91 |
| Sonamukhi | 72.11 | 77.94 | 72 | 3 | 23 | 54.17 |
| Patrasayer | 55.5 | 78.08 | 66 | 32 | 42 | 33.38 |
| Indus | 96.82 | 86.7 | 81 | 5 | 8 | 37.4 |

**Appendix XVI**

**Calculation of socio-economic development (1981) through PCA**

| Blocks | PC 1 | $Z_{pc1}$ | PC 2 | $Z_{pc2}$ |
|---|---|---|---|---|
| Bankura | 47.77018757 | -0.91201 | 26.40408 | -0.37225 |
| Onda | 61.15372793 | -0.19401 | 30.31488 | -0.14139 |
| Chhatna | 24.79317766 | -2.14468 | -2.28196 | -2.06564 |
| Gangajalhati | 59.41563299 | -0.28725 | 24.33574 | -0.49435 |
| Barjora | 60.39036361 | -0.23496 | 28.7933 | -0.23121 |
| Mejia | 44.48541061 | -1.08823 | 13.33613 | -1.14368 |
| Saltora | 49.11860173 | -0.83967 | 15.119 | -1.03843 |
| Khatra | 68.39428804 | 0.194436 | 35.77384 | 0.180864 |
| Indpur | 64.07220136 | -0.03744 | 29.54324 | -0.18694 |
| Ranibandh | 68.46445576 | 0.1982 | 29.79713 | -0.17195 |
| Raipur | 86.12556533 | 1.145685 | 49.45797 | 0.988664 |
| Simlapal | 86.4057039 | 1.160714 | 49.95132 | 1.017787 |
| Taldangra | 80.36367741 | 0.836571 | 35.01367 | 0.13599 |
| Bishnupur | 71.55626611 | 0.36407 | 72.29557 | 2.33681 |
| Joypur | 90.34318807 | 1.371952 | 46.06612 | 0.788437 |
| Kotulpur | 67.81821506 | 0.163531 | 38.52547 | 0.343298 |
| Sonamukhi | 73.8741672 | 0.488421 | 41.24994 | 0.504129 |
| Patrasayer | 34.19503288 | -1.64029 | 11.08513 | -1.27656 |
| Indus | 91.80084952 | 1.450153 | 46.64223 | 0.822445 |

**Appendix XVII**

**Variables for estimating socio-economic development (2001) of blocks of Bankura district**

| BLOCKS | %of irrigated area | %of arable land | Number of villager served by 100 primary school | Number ofvillage served by 100 health centers | Number of electrified village. | %literacy |
|---|---|---|---|---|---|---|
| Bankura | 74.89 | 85.15 | 68 | 13 | 79 | 61.45 |
| Onda | 82.22 | 85 | 79 | 5 | 58 | 50.27 |
| Chhatna | 42.39 | 97.55 | 72 | 12 | 55 | 50.09 |
| Gangajalhati | 57 | 87.41 | 72 | 8 | 68 | 51.83 |
| Barjora | 56.62 | 77.39 | 73 | 20 | 78 | 56.25 |
| Mejia | 40.77 | 75.15 | 82 | 17 | 92 | 51.01 |
| Saltora | 52.19 | 74.57 | 72 | 7 | 53 | 46.68 |
| Khatra | 62.03 | 75.4 | 78 | 12 | 83 | 52.69 |
| Indpur | 51.84 | 80.77 | 76 | 5 | 62 | 52.91 |
| Ranibandh | 51.53 | 87.29 | 78 | 18 | 33 | 31.73 |
| Raipur | 71.09 | 78.87 | 74 | 11 | 26 | 55.71 |
| Simlapal | 90.92 | 78.68 | 73 | 7 | 48 | 54.23 |
| Taldangra | 88.89 | 81.54 | 79 | 72 | 72 | 55.39 |
| Bishnupur | 83.58 | 86.66 | 75 | 76 | 76 | 33.72 |
| Joypur | 87.42 | 91.17 | 84 | 15 | 78 | 57.11 |
| Kotulpur | 85.31 | 84.49 | 71 | 11 | 82 | 58.79 |
| Sonamukhi | 71.49 | 84.73 | 80 | 85 | 85 | 41.95 |
| Patrasayer | 67.75 | 78.94 | 75 | 79 | 79 | 47.64 |
| Indus | 77.29 | 83.76 | 84 | 7 | 71 | 55.37 |

**Principal Component Analysis (PCA) Of Human Development Index of Bankura District-2001(Positiveness Index)**

| Blocks | HDI (%) | PC 1 | PC (1+2) | PC 2 | PC 1 Z Score | PC 2 Z Score |
|---|---|---|---|---|---|---|
| Bankura | 31.40 | 77.06 | 163.84 | 86.78 | -0.26 | 1.30 |
| Onda | 45.51 | 74.72 | 144 | 69.28 | -0.37 | -0.04 |
| Chhatna | 19.38 | 62.71 | 123.84 | 61.13 | -0.97 | -0.67 |
| Gangajalhati | 48.24 | 69.62 | 129.44 | 59.82 | -0.63 | -0.77 |
| Barjora | 51.32 | 77.85 | 154.8 | 76.95 | -0.22 | 0.55 |
| Mejia | 45.00 | 82.99 | 159.82 | 76.83 | 0.04 | 0.54 |
| Saltora | 17.71 | 62.1 | 121.18 | 59.08 | -1.00 | -0.82 |
| Khatra | 39.02 | 80.92 | 162.24 | 81.32 | -0.06 | 0.88 |
| Indpur | 48.14 | 65.08 | 131.3 | 66.22 | -0.86 | -0.28 |
| Ranibandh | 39.53 | 66.65 | 99.96 | 33.31 | -0.78 | -2.80 |
| Raipur | 27.59 | 56.16 | 114.98 | 58.82 | -1.30 | -0.84 |
| Simlapal | 45.15 | 69.71 | 146.04 | 76.33 | -0.62 | 0.50 |
| Taldangra | 58.82 | 111.5 | 190 | 78.55 | 1.46 | 0.67 |
| Bishnupur | 57.29 | 118.9 | 179.2 | 60.33 | 1.83 | -0.73 |
| Joypur | 57.01 | 89.79 | 176.48 | 86.69 | 0.38 | 1.29 |
| Kotulpur | 80.37 | 82.59 | 163.52 | 80.93 | 0.02 | 0.85 |
| Sonamukhi | 60.61 | 122.7 | 188.02 | 65.33 | 2.02 | -0.34 |
| Patrasayer | 48.15 | 112 | 179.52 | 67.53 | 1.49 | -0.18 |
| Indus | 75.73 | 78.94 | 160.36 | 81.42 | -0.16 | 0.89 |
| | *Mean* | 82.2 | | 69.82 | | |
| | *SD* | 20.01 | | 13.03 | | |

**Appendix XIX**

**Human Development Radar**

| Blocks | INDEX Value | | | | | | | HDI Score |
|---|---|---|---|---|---|---|---|---|
| | Gross Output | Wage Level | Enrolment | Female Literacy | Institutional Delivery | Sanitation | Cumulative Score | |
| Bankura | 1.80 | 2.93 | 3.95 | 2.45 | 2.85 | 3.29 | 17.27 | 57.56 |
| Onda | 1.09 | 3.09 | 4.19 | 2.3 | 2.21 | 0.53 | 13.41 | 44.70 |
| Chhatna | 0.92 | 2.57 | 4.07 | 1.62 | 1.22 | 1.87 | 12.27 | 40.90 |
| Gangajalhati | 0.93 | 3.31 | 3.96 | 2.25 | 3.23 | 0.98 | 14.66 | 48.86 |
| Barjora | 0.67 | 4.04 | 3.9 | 2.81 | 3.09 | 1.16 | 15.67 | 52.32 |
| Mejia | 0.62 | 3.68 | 3.98 | 2.21 | 3.35 | 1.31 | 15.15 | 50.50 |
| Saltora | 0.61 | 2.94 | 3.63 | 1.91 | 1.50 | 0.79 | 11.38 | 37.93 |
| Khatra | 0.56 | 3.13 | 4.59 | 2.52 | 1.97 | 0.89 | 13.66 | 45.53 |
| Indpur | 0.76 | 2.94 | 3.73 | 2.27 | 1.38 | 1.16 | 12.24 | 40.80 |
| Ranibandh | 0.56 | 2.57 | 3.94 | 2.21 | 2.1 | 0.53 | 11.91 | 39.70 |
| Raipur | 0.53 | 2.75 | 4.35 | 2.21 | 1.91 | 0.49 | 12.24 | 40.80 |
| Simlapal | 0.78 | 2.94 | 4.97 | 2.47 | 1.83 | 0.52 | 13.51 | 45.03 |
| Taldangra | 0.73 | 3.31 | 4.88 | 2.69 | 3.32 | 0.86 | 15.79 | 53.63 |
| Bishnupur | 1.01 | 4.04 | 4.52 | 2.26 | 3.05 | 2.66 | 17.54 | 58.48 |
| Joypur | 0.89 | 4.63 | 4.33 | 2.75 | 1.74 | 1.11 | 15.45 | 51.50 |
| Kotulpur | 0.91 | 4.63 | 4.31 | 2.9 | 2.85 | 4.89 | 20.45 | 68.30 |
| Sonamukhi | 0.83 | 4.04 | 4.6 | 2.52 | 2.89 | 1.30 | 16.18 | 53.93 |
| Patrasayer | 0.91 | 4.41 | 4.52 | 2.22 | 1.20 | 0.71 | 13.97 | 46.56 |
| Indus | 1.18 | 4.78 | 3.99 | 2.72 | 1.99 | 4.90 | 19.56 | 65.20 |

**Appendix XX**

**Calculation of backwardness (1981) through PCA**

| Blocks | PC 1 | $Z_{pc1}$ | PC 2 | $Z_{pc2}$ |
|--------|------|-----------|------|-----------|
| Bankura | -9.95 | -0.04 | -3.85 | -0.02 |
| Onda | -13.26 | -0.23 | -0.52 | 0.19 |
| Chhatna | 21.54 | 1.76 | 11.45 | 0.91 |
| Gangajalhati | -8.56 | 0.04 | -2.62 | 0.06 |
| Barjora | -16.05 | -0.39 | -8.76 | -0.31 |
| Mejia | -4.08 | 0.29 | 3.20 | 0.41 |
| Saltora | 5.38 | 0.84 | 1.49 | 0.31 |
| Khatra | 6.43 | 0.90 | 7.54 | 0.67 |
| Indpur | -0.84 | 0.48 | 0.15 | 0.23 |
| Ranibandh | 22.72 | 1.83 | 2.15 | 0.35 |
| Raipur | 11.28 | 1.17 | 31.97 | 2.14 |
| Simlapal | -14.52 | -0.30 | 1.04 | 0.28 |
| Taldangra | -15.62 | -0.37 | -7.98 | -0.26 |
| Bishnupur | -19.58 | -0.59 | -12.51 | -0.54 |
| Joypur | -29.04 | -1.13 | -5.09 | -0.09 |
| Kotulpur | -18.51 | -0.53 | 5.45 | 0.55 |
| Sonamukhi | -35.10 | -1.48 | -39.81 | -2.18 |
| Patrasayer | -14.54 | -0.30 | -7.30 | -0.22 |
| Indus | -43.10 | -1.94 | -44.33 | -2.45 |

# *Appendix – B*

## *Questionnaire*

General questionnaire to know the status of the human development at village level

Gram Panchayet:                              Head of the family:

Name of the Respondent:

Age:          Sex:          Educational Qualification:

Caste:

 Religion:

| Sl. No. | Name | Age | Sex | Education attainment | Monthly income/expenditure |
|---------|------|-----|-----|----------------------|----------------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

Are you a BPL card holder?

What kind of commodities receives from ration shop?

Any loan receives from Government?

| Sl. No. | Questions | Opinion | | |
|---|---|---|---|---|
| | | yes | no | don't know |
| 1 | Is village development done properly? | | | |
| 2 | Is poor people receive ration properly? | | | |
| 3 | Are ration dealers do unfair work? | | | |
| 4 | Is 100 days works done properly? | | | |
| 5 | Are 100 days works done more properly? | | | |
| 6 | Do you support mid day meal? | | | |
| 7 | Are political leaders taking decision from public? | | | |
| 8 | Are different projects fixed in gram Sava? | | | |
| 9 | Are winning and defeating parties jointly fixed any projects? | | | |
| 10 | Is there any relation between dealers and political leader? | | | |
| 11 | Do you support poorer receive money from bank and expend? | | | |
| 12 | Are poorer benefited from 100 days works? | | | |
| 13 | Are poor boys received grants? | | | |
| 14 | Do you support that only poorer are received grants? | | | |
| 15 | Are government programmes suitable for village development? | | | |
| 16 | Are political leaders unfair? | | | |
| 17 | Are poorer receives any facilities from Indira abas jyojona? | | | |