LINKAGE BETWEEN POVERTY, HUMAN RESOURCE DEVELOPMENT AND ECONOMIC GROWTH : AN INTEGRATED MODEL FOR BANGLADESH

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A Dissertation Submitted to the Department of Economics, University of Dhaka, in Partial Fulfillment for the Degree of Doctor of Philosophy

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CERTIFICATE

This thesis contains research on "Linkage Between Poverty, Human Resource Development and Economic Growth: An Integrated Model for Bangladesh". This research has been carried out by Ms.Tahmina Khatun, Associate Professor, Department of Accounting, Dhaka University, under my supervision. It is certified that the work included in this thesis is original.

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DECLARATION

I hereby declare that this thesis has been composed by myself and all the works presented herein are my own. I further declare that chapter two and chapter four have been published as working papers (No.84 and No.85) by the United Nations University/ Institute of Advanced Studies, Tokyo, Japan, which I presented in two seminars during my stay in UNU/IAS as a PhD fellow.

Tahmina Khatun

Mrs. Tahmina Khatun

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ACKNOWLEDGEMENT

It is my great pleasure to express my profound gratitude and indebtedness to my supervisor, Dr. Wahiduddin Mahmud, Professor, Department of Economics, Dhaka University, for his kind supervision, advice and constant encouragement in writing this thesis.

I am indeed very grateful to Dr. Yukio Ikemoto, Associate Professor, Institute of Oriental Culture, Tokyo University, Japan, for his valuable suggestions and comments on two chapters (chapters two and four) of my thesis.

I also greatly acknowledge the helpful comments and suggestions of Dr. N.S. Cooray , Research Associate, United Nations University/Institute of Advanced Studies and of Dr. Fu-Chen Lo, Former Deputy Director, United Nations University/Institute of Advanced Studies, Tokyo, Japan

I am also greatly indebted to UNU/IAS for giving me the opportunity to conduct my research there as a PhD fellow for a period of six months which helped me to update my thesis to a great extent and enabled me to publish two chapters of my thesis as working papers at UNU/IAS

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I deeply acknowledge the support and help of my department, Department of Accounting, Dhaka University, for allowing me to pursue higher studies in Tokyo, Japan, by granting me study leave for a period of six months. I would also like to express my gratitude to my colleagues for their help in different occasions during the course of my PhD work.

I also acknowledge the support of the Chairman and faculty members of the Department of Economics, Dhaka University, for encouraging me to pursue my research work.

Finally, I am greatly indebted to my husband, Dr. Ataharul Islam, Professor, Department of Statistics, Dhaka University without whose sincere cooperation, support, help and valuable suggestions, this study would have been impossible. I would also like to express my profound indebtedness to my children, Jayati and Amiya, for their constant support and help which encouraged me to complete my thesis within a short possible of time.

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ABSTRACT

"Poverty is in many ways a worst form of deprivation and can involve not only lack of necessities of material well being but also the denial of opportunities of living a tolerable life" (Anand and Sen, 1997). Human development is the process of widening people's choices and the level of well being they achieve. Income is only one option people would like to have but not the sum total of their lives. Income is thus a means but human development is the end. It is development of the people, for the people and by the people. An essential feature of human development paradigm is productivity which requires an investment in people and an enabling macro-economic environment for them to achieve their maximum potential. Economic growth is therefore a subset of human development needs---an essential part but not the entire structure (Huq, 1995). This implies that neither economic growth nor human development alone is sufficient for poverty reduction. The present study therefore gives emphasis on both economic growth and human development for poverty reduction.

The main objective of the study is to explore the possible linkage between poverty, human development and economic growth through an integrated approach based on three components of human development: education, health and nutrition. In analyzing such

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linkage, the study consists of two parts. In the first part an index of poverty has been developed for 106 selected countries on the basis of their achievement in economic growth, human development and levels of poverty by employing Principal Component Analysis (PCA). The same method has been applied in case of Bangladesh to rank the 64 districts on the basis of their achievements in economic growth, human development and levels of poverty. The ranking of countries are then compared with the rankings of countries based on HDI. In both these cases the results show that human development factors carried more weights than economic factors in ranking the selected countries and districts. In case of Bangladesh, Dhaka and Kurigram captured the first and last position respectively on the basis of their achievements in human development and economic growth which truly reflect the available data. By comparing the ranking of countries based on scores derived from PCA and HDI , it has been found that PCA is better measure of human welfare than HDI and reflects many aspects of human experience.

In the second part, three equations are formed based on three components of human development as mentioned above which are then estimated by multiple regression. In this part, all the three components of three equations are then integrated into a single model which is then estimated by factor analysis to explore the possible linkage between poverty, economic growth, human development as well as demographic factors. This analysis was based on data available for 74 selected developing countries. According to the results of multiple regression, the basic determinants of poverty identified are lack of income, lack of

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adequate expenditure on education, lack of adequate number of physician, high fertility rate and lack of adequate supply of food. Results of factor analysis identified three factors explaining the link between poverty, economic growth and human development as well as indicates the possible dimensions of poverty in order of priority.

The first factor labeled as basic needs dimension includes such factors as per capita income, sanitation, gross enrollment ratio at all levels, total fertility rate, daily calorie supply per capita and physician per population. The second factor comprising public expenditure on education and labour participation rate is labeled as basic capability dimension and the third factor comprising public expenditure on food production is labeled as basic entitlement dimension. The results of regression analysis more or less confirm the results of factor analysis.

The same approach was also applied to identify the possible linkage between poverty, economic growth and human development in case of Bangladesh. But in this case, since the value of R^2 in three regression models based on three components of human development appeared to be very low, the study uses only factor analysis incorporating all the variables of three components in a single model which is referred to as **integrated model for Bangladesh.** The most important dimension of poverty identified in case of Bangladesh is the social and economic dimension followed by nutritional and health

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dimensions of poverty. The first factor includes such variables as per capita income, landownership, literacy rate, agricultural employment, non-government employment electricity and sanitation. The second factor comprises such factors as daily calorie supply per capita and distribution of monthly expenditure on food while the third factor includes such factors as life expectancy and total fertility rate.

The analysis shows that poverty in Bangladesh is more structural than transient. However from the regression analysis and factor analysis, the study concludes that both economic growth and human development factors as well as demographic factors are important in explaining the level of poverty and that all should be jointly promoted in the process of poverty alleviation. The main difference of present study from the previous analysis is that it identifies possible dimensions of poverty in order of priority in exploring the link between poverty, human development and economic growth. Policies designed to reduce poverty therefore should take into account as many as possible the interrelationships between different components of human development and between human development, economic growth and poverty reduction.

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Chapter One

LINKAGE BETWEEN POVERTY, HUMAN RESOURCE DEVELOPMENT AND ECONOMIC GROWTH: AN INTEGRATED APPROACH

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1.1 Introduction

Although eradication of poverty and ending of hunger have been recognised as the most important challenges before human society, today there are more human beings suffering form chronic deprivation than ever before in history. The burden of poverty is spread unevenly---- among regions of the developing world, among countries within those regions and among localities within those countries. Nearly half of the world's poor live in South Asia, a region that accounts for roughly 30 percent of the world's population. (World Bank, 1990, p: 2). Among all developing nations, Bangladesh probably has the highest number of people in absolute poverty. The problem of poverty is much more acute in Bangladesh than in any country of South Asian region.

The government and civil societies of developing countries therefore now face the most urgent task of reducing poverty. The World Bank, other institutional institutions, governments , NGOs and local communities all need to redouble their efforts to achieve a substantial reduction in poverty over the next decade. Poverty reduction efforts have been successful in some regions than in others and there has also been a varying amount of success within regions. According to World Bank (1996) estimates, between 1987 and 1993, the incidence of poverty was a downward trend in East Asia, in the Middle East and North Africa and in South Asia. It has remained more or less stable in Latin America and Sub-Saharan Africa but increased in East Europe and Central Asia although levels of poverty appeared to be very low there. About 90 percent of the poor people in developing

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world today are located in Brazil, Central America, China, Indo China, Mongolia, South Asia and Sub-Saharan Africa. Successive studies have shown that the cost of eliminating endemic poverty within the shortest possible period is already within the reach of most developing nations. Nevertheless, the weight of global burden of poverty continues to be enormous with 1.31 billion absolute poor persisting below the $1 a day line adopted for international comparison in 1993.

According to World Development Report 1990, progress has been greatest in countries which have adopted a two part strategy: promoting the productive use of labour which have furnished opportunities for the poor and investing in health and education which have enabled the poor to take full advantage of the new possibilities. In Indonesia and Malaysia this approach has brought about a substantial reduction in poverty along with rapid improvements in education, under five mortality and nutrition (World Bank, 1990, p: 3). The East Asian Miracle in countries such as Indonesia, Korea, Malaysia and Thailand is an example of how policies that promoted growth in combination with investments in human resources led to dramatic decreases in poverty level. But it is not agreed by all that East Asia should be an appropriate model for South Asian countries. They felt that South Asia should find a development path of their own that is consistent with their democratic political institutions because East Asian countries have systems of government that are not shared by more democratically oriented South Asian countries (World Bank, 1993). The financial crisis of 1997-1998 in East and Southeast Asia has raised questions about sustainability of poverty reduction process. But it remains important that well before the

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crisis hit the economy, much of this area had eliminated food poverty. Most recent information suggests that great improvements in poverty reduction have not been that much affected by the crisis (Haan and Lipton, 1998, p: 135).

The 1998 Report on Human Development in South Asia argues that the real answer to development lies in changing the very model of development where human capabilities are built up, human opportunities are enlarged and where people become the real agents of development. In the global context, generally South Asian countries lag behind all other regions, both in its income and human development levels. But Sri Lanka is a major exception to this fact because even with a low level of income, Sri Lanka achieved education and health levels compared to many industrialized countries. As a consequence of better education and health levels combined with conscious efforts through family planning services there was a significant decline in population growth rate from 2.4% in 1960 to 1.5% in 1980. But despite this high performance in social indicators, Sri Lankan case shows that investments in human capital is a necessary condition but not a sufficient condition for sustainable development and thereby to reduce poverty.

This is because GDP growth was not high enough to sustain this successful social experiment. In 50s, large overall budget deficit and a continuous deterioration in balance of payment slowed the process of economic growth leading to low level of output and employment levels. As the report states, the most paradoxical thing was the growing

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tension between Tamils and Sinhalese which began in 1950s, exploded into open violence in 1980 at a time when economic growth had began to gather momentum.

Now the question is why Sri Lanka is experiencing a national problem of this nature while other countries such as Malaysia have been able to overcome their ethnic divide through policies of rapid human development and economic growth. Here comparison with Malaysia is particularly important because Malaysian governments made large investments in education, health and other social services for all classes of society--- but with much greater emphasis on Malays as the more disadvantaged group.

The experience of Sri Lanka is in sharp contrast to Malaysia. At least three policy mistakes have been made in enhancing social integration between Tamils and Sinhalese. First, for a long time, there was a serious imbalance between economic growth and human development. While human development indicators were high, GDP growth rate was very poor. Second, Sri Lanka made the mistake of extending some social services on a discriminatory basis, unlike the practice in Malaysia. For example, the government decided to give rural children privileged access to university education but the Tamil minority was discriminated against in this process. Third, many of the social services (particularly free rice rations) were cut down drastically. It is clear therefore, that Sri Lanka has to restore a proper balance between human development and economic growth and to create confidence among its people to participate equally in the opportunities of life (UNDP, 1997).

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In Bangladesh, the general human development conditions are dismal. More than a half of the population survives in absolute poverty-----the highest ratio in South Asia. In fact Bangladesh's progress on poverty reduction has been the slowest in Asia and it has the highest incidence of poverty in the region. According to the Report on Human Development in South Asia (1998), female emancipation and the spread of family planning services are the two positive aspects of recent human development advance of Bangladesh. The pace of economic growth in Bangladesh is rather slow. The rate of per capita income growth achieved during 1973-93 was only 5 percent which while appeared to be significant did not do much to alleviate poverty. Unemployment is extremely high among educated youth, causing social unrest and tension in the country. It is argued that Bangladesh can make fairly rapid progress if it invests liberally in its human capital. Lacking natural resources and threatened by ecological degradation, its main resource is its people. Experience shows that whenever Bangladesh invested in skill training, as in garments industry, it has made tremendous progress. But such investments in Bangladesh are limited and needs to be greatly accelerated (UNDP, 1998). Studies (Haan and Lipton, 1998) show that although export-led growth has begun even with very high illiteracy rates (e.g. textiles in Bangladesh), to upgrade exports---say from textiles to electronics or software, or even to raise the level of textiles techniques, --requires steady rises in skills and education indicating the importance of investment in human capital. The experience of poverty reduction in Bangladesh during 1990s also indicates the importance of economic growth in poverty reduction. This implies that both economic growth and human resource development are essential for poverty reduction in Bangladesh.

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The study by Haan and Lipton (1998) on poverty in Asian countries also shows that although there is a strong link between economic growth and poverty reduction, at least half of the variance in poverty among and within countries is not explained by that link. And even if some disadvantaged groups have shared in growth and poverty reduction, they have not achieved commensurate improvements in "human capital" indicating that even if girls and ethnic minorities in remote rural areas have kept up with national increases in consumption, they often still cannot reach schools and clinics. Gustav Ranis, Frances Stewart and Alejandro Ramirez (2000) argued in a recent paper that a focus on human development must be included from the beginning of any reform programme. Economic growth itself will not be sustained unless preceded or accompanied by improvements in human development Their findings also implied that although human development and economic growth should be jointly promoted, human development must be given sequential priority. But their study did not explicitly show whether there is any relation or linkage between poverty, economic growth and human development Actually, human development, economic growth and poverty alleviation can go hand in hand being interlinked with each other in a mutually reinforcing manner. The present study attempts to show through an integrated approach focusing on three components of human development (education, health and nutrition) that there is a strong link between poverty, human development and economic growth and with special reference to Bangladesh. It should be mentioned here that in the present study the concept of human resource

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development has been used synonymously with human development which view human beings both as a means and as an end of development.

1.2. Poverty Defined

There is no doubt today that poverty is a multidimensional issue including particular economic, social and other factors. According to UNDP Poverty Report 2000, the poverty targets set at the Social Summit are based on monetary measures while most development practitioners now agree that poverty is not about income alone but multidimensional. Therefore, it can be seen that despite differences in definitions, most donors, in common terms, conceive of poverty resulting from lack of human, physical and financial capabilities to sustain livelihoods. Accordingly, the manifestation of poverty is reduced or lack of access to material, economic, social, political or cultural resources needed to satisfy basic needs (CPD, 2000). However, World Bank defines poverty as a multidimensional element extending from low levels of health and lack of education to other non-material dimensions of well-being, including gender gaps, insecurity, powerlessness and social exclusion. UNDP defines human poverty as the denial of most basic opportunities and choices to lead a long., healthy, creative life and to enjoy a decent standard of living, freedom , dignity, self-respect and the respect of others. For Bangladesh, DFID views poverty as a phenomenon which incorporates illiteracy, lack of access to resources, social deprivation and vulnerability to disasters, sickness and other external shocks. Most donors, however, do not furnish any clearly articulated operational element arising out of their assessment of multidimensionality of poverty and the

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discussion in policy making circles in almost all countries including Bangladesh relates primarily to economic dimensions while other dimensions are generally ignored (Joshi, 1997). What is meant by that is that the basic objectives of development as the expansion of human capabilities was never completely overlooked in modern development literature but the focus has been mainly on the generation of economic growth, in the sense of expanding GNP and related variables. What is crucial in all this is to judge different policies, ultimately by, their impact on the enhancement of the capabilities that the citizens enjoy (Dreze and Sen, 1998). Human development denotes both the processes of investment in human capital (supply side) and participation of human beings in the benefits of development (demand side). It is development of the people, for the people and by the people. An essential feature of human development paradigm is productivity which requires an investment in people and an enabling macro-economic environment for them to achieve their maximum potential. Economic growth (in the sense of expanding GNP) being a subset of human development needs is an essential part but not the entire structure (Huq, 1995, p: 19). Human development is a people-centered process of development that creates sustainable opportunities for people to exercise more choices and realize their full potential (UNDP,1996).

The present study therefore gives emphasis on both economic growth and human development as a process to the reduction of poverty. However, the poverty definition used in the present study is the $1 per population per day. BBS, however, defines poverty in Bangladesh as a state of deprivation from availing goods and community services which

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are essential for normal level of living. In fact, poverty is a multidimensional phenomenon defined and explained as situation in which a person lacks the necessary capabilities and entitlements to satisfy his or her basic needs and aspirations.

1.3. Objectives of the Study

The objective of the study is to identify the determinants of poverty in selected developing as well as in Bangladesh and to explore the possible linkage between poverty, human resource development and economic growth with special reference to Bangladesh.

The specific objective first is to develop an index of poverty for 106 selected countries and also for 64 districts in Bangladesh on the basis of their achievements in economic growth, human development and levels of poverty. The second objective is to develop an integrated model for Bangladesh as well for selected developing countries to explore the linkage between poverty, human resource development and economic growth.

1.4. Data and Methodology

In analyzing the linkage between poverty, human resource development and economic growth , the paper has been divided into two parts.

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In the first part (Chapter 2 and 3), an index of poverty has been developed for 106 selected countries as well as for 64 districts in Bangladesh by employing Principal Component Analysis (PCA) in order to rank different countries on the basis of their achievements in human development, economic growth and levels of poverty.

In the second part (Chapter 4 and 5), the link between poverty, human development and economic growth has been explained by separate models. In fact, the linkage among them has been explained by method of Factor Analysis. In this part, an attempt has also been made to identify the determinants of poverty based on three components of human development: education, health and nutrition. Three separate equations has been formed based on these three components of human development which are then estimated by multiple regression. To analyze the link between poverty, human development and economic growth, the variables of all three components have been incorporated in a single model which is then estimated by Factor Analysis.

The same approach has been applied in analyzing the link between poverty, human development and economic growth in case of Bangladesh (Chapter 5).

The sources of data and variables used have been described separately for each section.

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Chapter Two

DEVELOPING AN INDEX OF POVERTY FOR SELECTED COUNTRIES BY APPLYING PRINCIPAL COMPONENT ANALYSIS

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2.1 Introduction

Poverty as a multidimensional phenomenon can be approached from different points of view. There are many conceptual approaches which have been used to measure poverty. The poverty measures based on income dimension is defined by Foster-Greer-Thorbecke class of poverty measures. It captures three aspects of poverty, its incidence, the depth and severity of poverty.

The incidence of poverty expressed as a head-count ratio is simply an estimate of the percentage of people below poverty line. It does not indicate anything about the depth or severity of poverty and thus does not capture any worsening of the conditions of those already in poverty. The depth of poverty can be measured as the distance below the poverty line expressed as a proportion of that line. The average is formed over the entire population, poor and non-poor. Because this measure --- also called poverty-gap--- shows the average distance of the poor from the poverty line, it is able to capture a worsening of their conditions. One drawback of poverty gap measure is that it may not convincingly capture differences in severity of poverty.

Sen (1976) has proposed a better measure of the severity of poverty. However, this measure does not satisfy another useful property which is simply called "additivity": this requires that aggregate poverty be equal to the population weighted sum of poverty levels

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in the various sub-groups of poverty.

A measure of severity of poverty which is additive is the Foster-Greer-Thorbecke, P_2 measure . The severity of poverty can be measured as a weighted average of the squared distance of the poor below the poverty line. The weights are given by each individual gap. Again the average is formed over the entire population. Since weights increase with poverty, this measure is sensitive to inequality among the poor. All three measures can be derived from the following formula:

$$P_a = 1/n \; q \; [(Z-y_i)/Z]^a$$

where Z is the poverty line, y_i is the income of the poor below poverty line, n is the total population and a represents the distribution weight; a=0 yields head-count index, a=1 poverty gap and a=2 distributionally sensitive squared poverty gap index.

While P_2 measure has clear advantage for some purposes, such as comparing policies which are aiming to the poorest, it is not easy to interpret. That is a drawback for expository purposes (Ravallion, 1982).

A broader criterion is adopted by World Bank for making an estimate of poverty all over the world. According to the Bank, the expenditure necessary to buy the minimum standard of nutrition and other basic necessities and a further amount varying from country to country and reflecting the cost of participating in every day life of the society should

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constitute the consumption-based poverty line. However, both contain socially perceived basic needs (Joshi, 1997, p: 201).

For producing a helpful account of various poverty alleviation programs, quite often the head-count ratio is used which again calls for the application of the concept of poverty line. In recent years the poverty lines have been updated/downdated on the basis of relevant price deflators. In all the exercises in which the statistical devices such as deflators are used, the wholesale price indices or consumer price indices for the rural as well as the urban poor have found a place. It appears that any person having a sound knowledge of statistics and even a little knowledge of economics can prove either an increase or decrease in the incidence of poverty. Therefore there is a need for a satisfactory measure of poverty (Joshi, 1997, p: 201).

Dissatisfaction with per capita GNP as an index of well-being has been widespread and seems to be growing. Three major types of problems arise in the use of per capita GNP as a measure of development or national well-being. The first problem relates to the nature of GNP, the second relates to the conversion of the local currency measures into a common denominator, typically the U.S dollar, and the well known bias in the use of market exchange rates for such conversions. The third relates to the problem that income does not necessarily measure well-being and that other parameters of income distributions are also important and should not be overshadowed by per capita GNP. The first problem is

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common to both developed and underdeveloped economies and while efforts have recently been made to rectify some of the drawbacks of the measure, it remains the principal index of what a country produces. The second problem received much attention from the UN and the World bank. Based mainly on a statistical estimation of average relationship across countries between (a) levels of consumption of various items, and (b) real income, UN (1980) computed real per capita GDP for a fairly large number of countries. In regard to third problem, an early UNRISD (United Nations Research Institute for Social Development, 1972) study attempted computation of a "general index" of socioeconomic development on the basis of inter-country data for 1960. Also Morris (1979) suggested a 'physical quality of life index' (PQLI) which could supplement the conventional per capita GDP measures. Morris worked with only three measures of development (life expectancy at age one and infant mortality and adult literacy rates) and did not include others because those were thought to be highly correlated with the three included. However, as Ram (1982) argues that there are some other important indicators of current basic needs fulfillment, like access to safe drinking water and availability of medical care which are not very well captured in the three PQLI constituents. Now the tendency has been to consider not merely per capita GNP but more importantly, a set of indicators of basic needs fulfillment which reflect directly the state of well-being of people in various countries (Ram, 1982, p: 228-229)

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Rati Ram (1982) suggested a simple method that enables one to obtain for any given inter-country sample, a single indicator of development that can encompass the information contained in per capita GNP as well as in the various indicators of basic needs fulfillment and other aspects of well being. The procedure suggested is the well known multivariate method of principal components which enables one to obtain, from a given set of variables that capture successively the largest proportion of variance in the original variable series. In his paper the application of the method is illustrated by extracting a principal component of the three constituents of Morris' PQLI and further by obtaining a composite index of development based on both the physical quality indicator and per capita GNP. Another example of the application of the method involves computation of a composite basic needs fulfillment index by deriving the first principal component of the five basic needs indicators published by World Bank (1980) and then obtaining a single development indicator based on the basic needs fulfillment index and per capita GNP. In computing the index, Ram followed 2-stage principal component procedure and found that principal component captures about 86% of the variation in the five indicators, viz., adult literacy, life expectancy, safe water access, physician per population and calorie intake, which shows that the composite index is quite a good representation of the extent of basic needs fulfillment conveyed by the five constituent indicators. But regardless of the simplicity of the method and that the method has an intuitive appeal, the main drawback of this study is that the variables chosen are dimensionally different. For example, while adult literacy refers to the literacy of adults, the other variables refer to whole population and therefore

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the variables cannot be reduced to dimensionally similar terms.

The HDR 1990 first introduced a different way of measuring human development - by combining indicators of longevity, educational attainment and standard of living into a composite Human Development Index (HDI). The longevity is now measured by life expectancy at birth, the educational attainment is measured by a combination of adult literacy rate (two-thirds weight) and combined gross primary, secondary and tertiary enrollment ratio (one-third weight) and standard of living is measured by GDP per capita (PPP US$). The per capita income (PCY) is used as a proxy measure for satisfaction derived from a bundle of basic goods and services. Life expectancy reflects the progress made in such fields as health, child mortality and nutrition. The HDI sets a minimum and maximum for each dimension and then shows where each country stands in relation to these scales - expressed as a value between 0 and 1. The minimum adult ratio is 0% and the maximum is 100%, and similar is the case for the combined gross enrollment ratio. Similarly, the minimum for life expectancy is 25 years and the maximum 85 years, so the longevity component for a country where life expectancy is 55 years would be 0.5. For income the minimum is $100 (PPP) and the maximum is $40,000 (PPP). For any component of the HDI, individual indices can be computed according to following formula:

Index = (Actual x_i value - minimum x_i value)/(maximum x_i value - minimum x_i value)

If for example, the life expectancy at birth for a country is 65 years, the index of life expectancy for this country would be:

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Life expectancy Index = (65-25)/(85-25)=0.667. But for income in the construction of HDI, now income is treated using the following formula:

$W(y) = (\log y - \log y_{min})/(\log y_{max} - \log y_{min})$.

The HDI is a simple average of the life expectancy index, educational attainment index and adjusted real GDP per capita (PPP$) index and so is derived by dividing the sum of these indices by 3 (UNDP, 1994, p.91).

Now the question is why only three components, because the idea would be to reflect all aspects of human experience. The 1994 HDR report says that lack of data imposes limits on this . But it added that adding more variables could confuse the picture and detract from the main trends and that some indicators might overlap with existing indicators. However, the linkages between poverty and human development become clear only when we take a broader view of the problem of poverty instead of depending on the much used as well as much abused concepts of per capita income or expenditure scale (Joshi, 1997, p. 203).

Use of multiple measures is obviously desirable in several respects. It moderates an exclusive focus on income and offers a more direct perspective on the condition of poor people in various countries. Adult literacy rates, access to safe drinking water, primary school enrollment rates, availability of basic medical care, average life span of people,

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calorie or protein intake levels, all convey important information that is not easy to obtain from per capita GNP. Nevertheless, multiplicity of such indices and multidimensionality in their representation can constitute serious impediments in one's efforts at summarizing the situation compactly and at making inter-country comparisons. Although the various measures do correlate with each other in varying degrees, they diverge in many important ways; indeed, such a divergence is one source of their usefulness; if they were perfectly correlated, one could serve just as well as all of them. Therefore one may find that inter-country inequality is high on one measure, low on another, and very low on yet another. Thus a country may be high on one index, and low on another, and it might be quite difficult to make overall comparisons across countries (Ram, 1982, p: 228-229).

The HDR report (1997) presents a human poverty index (HPI) and ranks 78 poor countries by this index. These index values, and the ranks, tell us how the intensity of poverty varies across these countries. The Report recognizes that poverty is multidimensional, and that poverty measures based on income criterion do not capture deprivation of many kinds. "Human poverty", it says, "is more than income poverty - it is the denial of choices and opportunities for living a tolerable life." It introduces three types of deprivation: in survival, in education and knowledge, and in economic provisioning, as important dimensions of poverty.

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The Human Poverty Index (HPI) is based on three different types of deprivation:

(1) Survival deprivation, as measured by the percentage of people (in a given country) not expected to survive to age 40 years (P_1); (2) Deprivation in education and knowledge, as measured by adult literacy rate (P_2); (3) Deprivation in economic provisioning (P_3) which is computed as the mean of three variables: population without access to safe water (P_{31}), population without access to health services (P_{32}) and underweight children under the age 5 years (P_{33}) - all three expressed in percentages. That is, the composite variable P_3 is constructed by taking a simple average of the three variables, P_{31}, P_{32}, P_{33}. Thus

$$P_3 = [(P_{31} + P_{32} + P_{33})]/3$$

The HPI is then obtained as the cube root of the averages of cubes of the three components of deprivation. This is a "power mean' of order 3. The power mean of order one is the simple mean, the average of values. Thus the formula for HPI is given by:

$$HPI = [(P_1^3 + P_2^3 + P_3^3)/3]^{1/3}$$

Several questions can be asked about this particular choice of variables for describing and quantifying deprivation and about the reliability of the data actually used. N. Krishnaji (1997) in his recent article on "Human Poverty Index: A Critique" attacked the HPI on several grounds. These are mentioned below:

(1) First, in constructing HPI, many important variables have been excluded. In particular, however, the deprivation of 'economic provisioning ' as computed in the Report, is not representative.

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(2) Second, the variables chosen are dimensionally different. Deprivation in terms of survival (P_1), in access to safe water (P_{31}) and in access to health services (P_{32}) relate to whole population, while adult literacy (P_2) refers to the population of adults. The incidence of underweight children refers to the population of children below 5 years of age. The variables thus are on different population aggregates.

As Krishnaji pointed out, to avoid curious mixture, it will be advantageous to use population literacy rates instead of adult literacy rates. Similarly, instead of proportion of underweight children one can employ a measure of under-nutrition for the whole population. He therefore added that such modifications will reduce all variables to dimensionally similar terms, referring to the population as a whole. He also pointed out the dissimilarity present in the time dimension as well. For example, adult literacy as observed now is the result of neglect in the past, covering several decades. This is true for many nations including Bangladesh and India. Prospects of survival to the age 40 are computed, however, at current age-specific mortality rates. He concludes that in a regime of continuously falling mortality rates, varying widely across countries and over time , such measurements of survival rates, without reference to the actual course of decline in mortality and how it was brought in the different countries, can be misleading.

(3) Third, question has also been raised as to the data quality inherent in constructing HPI. For example, as Krishnaji observed, the percentage of population with no access to

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'safe water' is given as 19 and 3, respectively, for India and Bangladesh. According to him, it is difficult to accept that 97 percent of the people in Bangladesh have access to safe water, given the high proportion of deaths due to water-born diseases in both these countries.

In Krishnaji's paper, seven different methods have been used for computing poverty index including HPI and Principal Component Method (PCM). Comparing all seven different methods, the author argues that although the PCM does not give us an overall index of deprivation in its calculated form, it is a good choice for ranking from the statistical point of view because it exploits the existence of correlations among the variables considered.

The author of the present study used the same method (PCM) for deriving component scores for 30 developing countries using nine socio-economic and demographic variables (Khatun, 1996). By comparing the scores derived by PCM with the rankings of HDI representing human development, it was found that Principal Component scores give better estimates of human welfare than HDI. It is true that when many variables are measured, some practical problems arise. With large number of variables the number of relationship is so large as to beyond comprehension and some data reduction technique is clearly needed. One such data reduction technique is Principal Component Method (Dillon and Goldstein, 1984). Moreover, since poverty is multidimensional, we also need a multidimensional measure that goes beyond income and focuses on many dimensions of

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human lives affected by poverty. Principal Component Analysis is such a measure which can capture various dimensions of poverty.

The main purpose of Principal Component Method is to determine the principal components in order to explain as much as total variation in the data as possible with as few of these factors as possible. In addition, the first principal component yields the linear combination of the variables having the largest variance, subject to the condition that the sum of the squares of the coefficients is unity. The result is of course not a mean value (because the weights do not add up to unity) but the procedure has the obvious merit of widening the distances among the countries to the maximum extent, so that borderline cases are as clearly separated as possible. (Krishnaji, 1997, p: 2205).

2.2 Limitation of the Method

Rati Ram (1982) in representing Principal Component Analysis for developing a composite index mentioned some of the drawbacks of this method which are described below. First, the proposed method cannot solve the index number problems basically

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inherent in the construction of such indicators and composite indices. Nor can it remove the deficiencies that may pervade LDC data relating to the various indicators. Second, the proposed method has some procedural ambiguities in the sense that one would get somewhat different results if the method is applied in a different way rather than applying the 2-stage Principal Component procedure. However, as he points out, such procedural ambiguities seem no more severe in the approach proposed here than in any other method that could be suggested for developing such composite indices. Third, the method is obviously not useful for computing a welfare index in the aforesaid sense if the postulated welfare function is non-linear. However, if the welfare function is linear and the parameters of the functions are unknown, the method proposed here could be useful even for computing a welfare index (Ram, 1982).

Despite the above limitations, Ram concludes that the procedure suggested is simple, has intuitive appeal and seems to possess considerable potential in application. While there is nothing perfect about the method and it does have some drawbacks, it seems preferable to almost any other alternative available for the purpose. Therefore, application of the method for the present purpose seems to constitute one significant step toward the evolution of composite development index for each country and will facilitate international comparison.

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2.3. The Method of Principal Component

The method used to derive the component scores using six socio-economic and demographic variables for reflecting human progress is Principal Component Analysis (PCA). PCA transforms the original set of variables into a smaller set of linear combinations that account for most of the variations of the original set. The principal component are extracted so that first principal component denoted by PC_1 accounts for the largest variation in the data. That is PC_1 is that linear combination of the observed variables X_j, j= 1, 2....., p -say,

$$PC_{(1)} = w_{(1)}\,1X_1 + w_{(1)2}\,X_2 + \ldots\ldots\ldots + w_{(1)p}\,X_p \ldots\ldots\ldots(1)$$

where weights $w_{(1)1}$, $w_{(1)2}$,.....$w_{(1)p}$ have been chosen to minimize the ratio of variance of $PC_{(1)}$ to the total variation subject to constraint $P_{j=1}\,w_{2(1)j} = 1$.

The second principal component $PC_{(2)}$ is that weighted linear combination of observed variables which is uncorrelated with the first linear combination and which accounts for the maximum amount of the remaining total variation not already accounted for by $PC_{(1)}$ (Dillon and Goldstein, 1984).

In general then the mth Pc is weighted linear combination of the Xs

$$PC = w_{(m)1}\,X_1 + w_{(m)2}X_2 + \ldots\ldots\ldots + w_{(m)p}X_p \ldots\ldots\ldots(2)$$

which has the largest variance of all linear combinations that are uncorrelated with all of previously extracted PC.

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It must be stressed that a principal component analysis does not always work in the sense that a large number of original variables are reduced to a small number of transformed variables. Indeed if the original variables are uncorrelated then the analysis does absolutely nothing. The best results are obtained when the variables are correlated, positively or negatively (Manly, 1986, p: 60). One merit of PCA is that an increase in the number of variables that one may wish to include for deriving a composite index imposes very little cost on the analysis and one can include many related variables for deriving the principal components (Ram, 1982: 227-247).

2.4. Data and Methodology

This study uses six variables, such as gross enrollment ratio (GER), life expectancy (LE), access to safe drinking water (SDW), access to sanitation (SAN), total fertility rate (TFR) and per capita GNP (PCY, PPP$) as the basis for computing the scores for 106 selected countries. The data have been taken from World Development Indicators 1998, Human Development Report, 1998 and Social Indicators of Development ,1996. In a study by Jolliffe (1973, p: 31), it is suggested that in any problem using principal components at least four variables should be retained.

It is to be noted that the variables chosen for the present case refer to the whole population and can be reduced to dimensionally similar terms.

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According to late Mahbub ul Haq (1995), "the basic goals of development are access to basic education, primary health care, provision of family planning facilities, elimination of serious malnutrition and provision of safe drinking water". The reasons for the choice of these particular variables have been described below:

(1) Per capita income is used as a proxy measure for satisfaction derived from a bundle of basic goods and services. It is used as a measure of standard of living of the people.

(2) The educational attainment which is the basis of human development and the most important indicator of human welfare is measured by gross enrollment ratio at all levels.

(3) Life expectancy reflects the progress made in such fields as health, child mortality and nutrition. Since life expectancy already measures progress made in nutrition, the variable calorie intake per capita has been dropped from the analysis because it might overlap with other indicators. In a study by Ogwang (1994, p: 2013) on the choice of principal variables for computing Human Development Index, it has been found, using the selection strategy by Joliffe (1973), that of the three variables, life expectancy appeared to be the best choice.

(4) Access to safe drinking water and access to sanitation have been used as a proxy variables to measure progress in economic provisioning. Access to health care has not been considered because of lack of information in case of many developing countries. Due to unavailability of data, it was not possible to consider such important variable as proportion of under-nutrition representing the whole population.

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(5) TFR has been used as an indicator of poverty because there is a strong correlation between poverty and TFR. Rapid population growth is linked as both the cause and effect to low human resource development, particularly for girls and women. The higher the TFR, the higher the incidence of poverty and vice versa. Therefore TFR can be considered as one of the components indirectly affecting human development and thereby the level of poverty.

2.5. Result of the Analysis: Developing an Index of Poverty for 106 Selected Countries

Before discussing the component scores, it is necessary to analyze the data by interpreting the first two principal components. It should be mentioned here that as a convention only first two principal components have been retained in the present case to analyze the data and the values of first principal component have been used to derive the component scores because this component alone explains about 79 percent of the total variance. Table 2.1 presents the eigenvalues and cumulative proportion of the total variance explained.

Table 2.2 shows the respective component correlations. From the component loadings we see that component 1 which accounted for about 79 percent of the total variance is clearly dominated by human development factors, with life expectancy having the highest loading compared to economic factor such as PCY.

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Using the values of first component, component scores for 106 selected countries have been computed and these are then compared with HDI (1999) developed for this 106 countries published in HDR 1999.

The component scores for 106 selected countries shown in Table 2.3 using the standardized data have been calculated in the following way:

The first principal component is

$$Z_1 = .413X_1 + .397X_2 - .409X_3 + .425X_4 + .391X_5 + .412X_6,$$

where X_1 to X_6 are standardized variables. This is an index of poverty (Z_1) on the basis of human development and economic growth. It seems therefore that 79% of the variation in the data are related to differences in attaining human development and economic growth.

It should be mentioned here that the second component explained about 7 percent of the variation of the data and when scores are computed using the coefficients of the second component, the results obtained do not have any relevance to reality. That is the ranking of the countries according to second component does not reflect the reality. Therefore for convenience, only first component is used in the present case. From Table 2.3 it can be seen that when we compare the rankings of the countries according to the two methods, there are marked differences between the rankings in the countries and the differences range from 1 to 21. This difference is expected since the present study considers more as well as different types of variables compared to those taken to compute HDI. To test the

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degree of the association between two types of rankings, Spearman's rank correlation has been calculated. The estimated rank correlation is .95 which shows that there is strong general agreement between two types of ranking. By testing the significance of the association, it has been found that the correlation between the two methods is significant However, the difference in two types of ranking is due to differences in the number and type of the variables selected. As mentioned earlier, this difference is expected since in PCA, six variables have been chosen while in constructing HDI only three variables have been selected to reflect human progress. From the comparison of rankings, it has been found that some countries have been placed in higher position(+) according to (Principal Component) PC score compared to that according to HDI score while some are placed in lower position (-) according to PC score which were placed in higher position according to HDI score (see Table 2.5). The higher difference (> or =10) has been found in case 27 countries. For convenience, only differences greater than 15(or equal to) are discussed and justified in each case. The countries fall in this category are Paraguay, Bangladesh, Cote^d'Ivoire, Gambia, PNG, Lesotho and Cambodia. From this table it can be seen that Paraguay has been placed in 67th position according to PC score while it has been placed in 46th position according to HDI (1999) score. It can be seen from the Table that Philippines has been placed in 46th position according to PCA while it has been placed in 41st position according to HDI score. That is, according to both methods Philippines has been placed before Paraguay. The highest difference in ranking (21) in case of Paraguay is because of number of countries placed before Paraguay and after Philippines. In between

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Philippines and Paraguay, there are 20 countries according to PC ranking but according to HDI ranking, only five countries fall in between them. The countries like Indonesia, China, South Africa, India, Egypt, Bolivia, Oman etc. have been placed after Paraguay according to HDI ranking. But available data suggest that all the countries placed before Paraguay and after Philippines according to PCA have a balanced combination of both human development and real GDP per capita growth. But despite higher life expectancy and gross enrollment ratio, Paraguay has much lower proportion of population having access to sanitation and safe drinking water. So Paraguay seems to be deprived in terms of basic economic provisioning and therefore placed in a lower level of human development. Secondly, in case of Bangladesh, it can be seen (Table 2.3) that it has been placed in 71st position according to PCA while it has been placed in 86th position according to HDI. It can be seen from the Table that Zimbabwe has been placed into 71st position according to HDI while it has been placed in 59th position according to PCA. That is, Zimbabwe has been placed in higher position compared to Bangladesh according to both type of methods. According to PC ranking, 11 countries fall in between Zimbabwe and Bangladesh and in case of HDI ranking, 14 countries fall in between them. Countries like Botswana, Egypt, Gabon, Nicaragua, Guatemala, Bolivia, Namibia and Morocco have been placed before Zimbabwe according to HDI ranking while the opposite happened in case of PC ranking. But it can be seen that the number of countries placed before Bangladesh and after Zimbabwe according to PCA have lower level of human development compared to Zimbabwe which has a much balanced combination of human

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development compared to other countries above, for example Egypt and Nicaragua (see Table 2.4). Thirdly, in case of Gambia, it can be seen that it has been placed in 77th position according to PCA but in 98th position according to HDI. Madagascar has been placed in 98th position according to PCA while it has been placed in 84th position according to HDI. That is Madagascar has been placed before Gambia according to HDI while the opposite happened in case of PCA. But the available data show that Gambia has much higher level of human development as well as real GDP per capita compared to Madagascar. Fourthly, in case of Lesotho, it can be seen that it has been placed in 90th position according to PCA while it has been placed in 69th position according to HDI. According to HDI, Cote^d'Ivoire has been placed in 90th position which has been placed in 73rd position according to PCA.

That is Cote^d'Ivoire has been placed before Lesotho according to PCA while the opposite happened in case of HDI. Data analysis suggest that much higher proportion of people having access to safe drinking water and more or less same life expectancy with same level of PCY (but despite lower GER) may contribute to place Cote^d'Ivoire in higher position compared to Lesotho. Fifthly, PNG has been placed in 70th position according to HDI but in 87th position according to PCA. But according to PCA, Kenya has been placed in 70th position while it has been placed in 76th position according to HDI. That is Kenya has been placed before PNG according to PCA while opposite happened according to HDI. From the data analysis, we can say that Kenya has much higher level of population having access to safe drinking water and sanitation, low fertility, much higher

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gross enrollment ratio compared to PNG with same life expectancy despite much higher level of real GDP per capita in PNG. Lastly, Cambodia has been placed in 77th position according to HDI while it has been placed in 93rd position according to PCA.. According to HDI, Uganda has been placed in 93rd position while according to PCA, Uganda has been placed in 97th and Gambia in 77th position. That is according to both methods, Cambodia has been placed before Uganda. Actually the differences in case of ranking are due to large number of countries placed after Cambodia and before Uganda according to HDI than those according to PCA. Data analysis show that differences between these two countries in terms of human development as well as in terms real GDP per capita is not so much (Cambodia has much lower proportion of people having access to safe drinking water and sanitation but much higher life expectancy and gross enrollment ration compared to Uganda). Uganda is higher in one aspect of HD while Cambodia is higher in other aspect of HD and number of countries falling in between them should not be too many.

Therefore, since PCA takes into more variables than HDI, it is expected that PCA gives better measure of human progress and reflects many aspects of human experience. However for convenience, the countries which are placed in higher place according to PCA compared to HDI are grouped into one category while the countries which are placed in lower position according to PCA compared to HDI has been grouped into another country (see Table 2.5). It should be mentioned here that 50 countries are placed

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in higher or lower position on the basis of both economic growth and human development. The analysis has been further extended by comparing the rankings according to HDI (1999) (by considering same three components which were used in constructing HDI) with the rankings of the same countries according to PCA. The analysis shows that first principal component (see Table 2.7) explains about 80% of the variation in total data and that differences in rankings range from 0 to 14. The highest difference is found in case of Malawi followed by Ukraine and Saudi Arabia. It is to be mentioned here that according to HDI, highest position is captured by Canada while according to PCA, it was USA which captured the highest position considering only three components. It is to be noted here that although Canada ranks higher in terms of human development the real GDP per capita is much higher in USA than in Canada with more or less the same level of human development n USA. Therefore, USA has been placed in the highest position in terms of both economic growth and human development because studies show that there is no trade-off between economic growth and human development and that both should be jointly promoted in the process of economic development.. By contrast, it is to be noted that lowest position is captured by Niger according to PCA while it was captured by Sierra Leone according to HDI. But data analysis show that Niger has much lower human development (adult literacy rate and gross enrollment ratio are much lower in Niger compared to Sierra Leone). Now in case of Malawi, it can be seen (Table 2.6) that it has been placed in 80th position according to PCA while it has been placed in 94th position according to HDI. According to PCA, Senegal has been placed in 94th position while it

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has been placed in 89th position according to HDI. Thus according to HDI, Senegal has been placed in higher position compared to Malawi while the opposite happened in case of PCA. But available data show that Malawi has much higher adult literacy rate and gross enrollment ratio compared to Senegal which placed it in a higher position. Now regarding Ukraine it can be seen that it has been placed in 39th position according to PCA and in 51st position according to HDI. From Table 2.6, it can be seen that China has been placed in 51st position according to PCA while it has been placed in 53rd position according to HDI. That is although according to both HDI and PCA China is placed after Ukraine, the number of countries falling in between them is much higher (11) in case of PCA than in case of HDI (2). It can also been seen that except two countries, Jordan and South Africa, all other countries were placed before Ukraine according to HDI. Available data show that the countries placed after Ukraine and before China have lower level of human development compared to Ukraine and therefore placed in lower position compared to Ukraine according to PCA. Lastly, regarding Saudi Arabia, it can be seen that it has been placed in 52nd position according to PCA while in 42nd position according to HDI. From Table 2.6, we see that Brazil has been placed in 42nd position according to PCA and 43rd position according to HDI (just after Saudi Arabia). That is Brazil has been placed in a much higher position compared to Saudi Arabia according to PCA while the difference between two countries is very insignificant according to HDI. Data analysis show that the countries falling between Brazil and Saudi Arabia according to PCA have attained higher human development compared to Saudi Arabia despite much higher level of income in

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Saudi Arabia. The findings show that PCA gives more accurate estimates of human development and economic growth because it gives estimates based on actual value of the components and that it gives more weights to the components (see Table 2.8) based on human development than on income components. Although there is strong general agreement between two types of methods (r=.96), the main advantage of PCA is that exact values can be used to calculate the scores and no such minimum and maximum values have to be set for any components as in HDI. The present study also calculated the component scores for 106 countries using four as well as five variables by iteration. But it has been found that the ranking of countries seems to be the best when it is based on six variables explaining most of the variations in total data. Also the ranking of countries using six variables seem to be much more realistic compared to those with three, four or five variables. For example, if we look at Table 2.3 (using six variables), we see that if we consider African countries, Kenya has higher life expectancy, higher percentage of population having access to sanitation and much higher level of enrollment ratio at all levels compared to Bangladesh and therefore it has been rightly placed before Bangladesh.

But if we look at Table 2.6 (using three variables), we see that Sudan has been placed before Bangladesh but in Table 2.3 we see that it has been placed after Bangladesh. Now if we look at the available data (appendix 1), we can see that Sudan has lower achievement in respects of both economic growth (lower GDP per capita, PPP$) and human development compared to Bangladesh and therefore should be placed after Bangladesh

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and therefore rankings based on three variables do not reflect the reality.

2.6. Conclusion

It is evident from the findings of the paper that PCA is more sensitive than HDI in determining the ranks. PCA can take into more variables in order to increase the explanatory power of the index for development. Since PCA takes into more variables than HDI, even the small changes in the scores attributable to other factors beside the major component, such as GNP per capita, can be clearly shown in the result. In a sense, the principal components account for all of the variation in the original data. The main problem of HDI is that it is subject to constant modifications. The HDI sets a minimum and maximum values for each dimension and especially for income, previously, income above the average world income is adjusted using a progressively higher discount rate. Although the present method of computing HDI does not discount income as highly as before still all income is subject to discounting. But in case of PCA, no such minimum and maximum values have to be set and exact values for income as well as for other variables can be used for each country to calculate the scores. Further as Kelley (1991) comments that since HDI is based on country's position along a range of maximum and minimum values for each indicator, the specific weight of that indicator in HDI can be sensitive to choices of these endpoints for which HDR tends to select exceptional values. In fact, as

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the author argues, the HDI turns out to be quite sensitive to the choice of maximum life expectancy. As an experiment, the author set the adequate or desirable life expectancy at age 73 (the average of developed countries in 1987) instead of 78 (a maximum value attained by only country Japan) and found that this raised some countries from low to medium and some countries from medium to high human development. Moreover, the HDI values for the developed countries vary from .96 to 1.00. As a result, the HDI has operational meaning only for developing countries whose values vary from .12 to .95.

Secondly, HDI cannot take correlated variables into account. But PCA is a data reduction technique and it can take as many variables as well as correlated variables into account. Lastly, as Chowdhury (1991, p: 125) pointed out that in constructing the HDI, equal weights were given to its three components without providing any justification for doing so. Moreover, it is not known as to how sensitive HDI is to changes in the weighting system employed. Hence, the ranking of countries according to HDI can at best be considered as illustrative rather than evaluative. According to Kelley (1991, p:30), the specific weighting requires detailed justification about which the HDI is substantially silent. In contrast, in the Principal Component Analysis, the weights are different so that scores calculated are sensitive to the weights and therefore each component would carry different information regarding human development. The method of principal components provides an easy procedure for letting the data determine the optimal weights that capture the largest fraction of the variance (Ram, 1982). To quote Srinivasan (1994, p: 243) " HDI is conceptually weak and empirically unsound involving serious problems of non-

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comparability over time and space, measurement error and biases. Meaningful inferences about the process of development performance as well as policy implications could hardly be drawn from variations in HDI." According to Tilak (1992), there are several other important indicators, in the absence of which it may be wondered whether the HDI is comprehensive and therefore the indicators chosen are too few to comprehend human development.

HDI has serious limitations and the present study makes an attempt to improve the index by introducing more variables by the application of a simple method such as PCA. By testing the significance of the association between types of methods, it has been found that there is significant association between two types of rankings. But a general agreement between two types of methods does not always ensure about the suitability of the method as HDI. This high correlation is expected since the variables included in HDI are part of the variables employed in PCA. . But the analysis of the findings show that PCA scores determine with greater efficiency even the small changes attributable to other factors, in addition to the major components of human development. That is, the sensitiveness of PCA to the ranking of countries that cannot be detected by HDI can always be made sure through PCA . It is more sensitive to a more broader and wider spectrum of situations that are happening in the process of economic development. Thus we can conclude that PCA is a better measure than HDI to reflect human progress and shows many aspects of human experience.

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Table 2. 1: Eigenvalues and Accounted for Variance (using six variables)

Components	Variance Explained of Total Variance	Cumulative Proportion
Prin1	4.7125	0.78543
Prin2	0.4399	0.85875
Prin3	0.3396	0.91535
Prin4	0.2087	0.95014
Prin5	0.1696	0.97840
Prin6	0.1295	1.000

Table 2.2: Component Loadings (using six variables)

Variable	1	2
Safe drinking water (SDW)	.413	-.046
Sanitation (SAN)	.397	.205
Total Fertility Rate (TFR)	-.409	.413
Life expectancy (LE)	.425	-.280
Per Capita GNP (PCY)	.391	.827
Gross enrolment ratio (GER)	.412	-.152

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Table 2.3: A Comparison of Ranking of Some Selected Countries based on Scores Derived from PCA and HDI (using six variables)

Countries	PC Score	HDI Score	PC Ranking	HDI Ranking	Relative HDI	Difference
Canada	1.58	.932	1	1	1	0
Norway	1.57	.927	2	2	2	0
Austria	1.53	.904	3	16	13	+10
Switzerland	1.53	.914	4	12	10	+6
Netherland	1.52	.921	5	8	7	+2
USA	1.52	.927	6	3	3	-3
Belgium	1.52	.923	7	5	4	-3
Finland	1.51	.913	8	13	11	+3
France	1.51	.918	9	11	9	0
Denmark	1.49	.905	10	15	12	+2
Sweden	1.44	.923	11	6	5	-6
UK	1.42	.918	12	10	8	-4
Italy	1.41	.900	13	19	14	+1
Spain	1.40	.894	14	21	16	+2
Ireland	1.38	.900	15	20	15	0
Singapore	1.36	.898	16	22	17	+1
Australia	1.29	.922	17	7	6	-11
Greece	1.23	.867	18	27	19	+1
Portugal	1.22	.858	19	28	20	+1
UAE	1.10	.812	20	43	25	+5
Korea Rep. Of	1.03	.852	21	30	21	0
Israel	0.99	.883	22	23	18	-4
Poland	0.94	.802	23	44	26	+3
Beralus	0.91	.763	24	60	36	+12
Mauritius	0.89	.764	25	59	35	+10
Bulgaria	0.82	.758	26	63	37	+11
Hungary	0.81	.795	27	47	28	+1
Chile	0.77	.844	28	34	22	-6
Uruguay	0.68	.826	29	40	24	-5
Panama	0.61	.791	30	49	30	0
Croatia	0.58	.773	31	55	32	+1
Malaysia	0.56	.768	32	56	33	+1
Turkey	0.55	.728	33	86	47	+14
Tunisia	0.54	.695	34	102	55	+21
Argentina	0.53	.827	35	39	23	-12
Trinidad & Tobago	0.51	.797	36	46	27	-9
Romania	0.48	.752	37	68	39	+2
Ukraine	0.46	.721	38	91	51	+13
Jordan	0.41	.715	39	94	52	+13
Mexico	0.39	.786	40	50	31	-9
Venezuela	0.38	.792	41	48	29	-12
Thailand	0.37	.753	42	67	38	-4
Jamaica	0.35	,734	43	82	45	+2
Dominican Republic	0.34	.726	44	88	47	-3
Columbia	0.33	.768	45	57	34	-11

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Table 2.3 (continued)

Countries	PC Score	HDI Score	PC Ranking	HDI Ranking	Relative HDI	Difference
Philippines	0.31	.740	46	77	41	-5
Syrian Arab Republic	0.26	.663	47	111	59	+12
Ecuador	0.23	.747	48	72	40	-8
Saudi Arabia	0.17	.740	50	78	42	-8
Brazil	0.16	.739	51	79	43	-8
South Africa	0.13	.695	52	101	54	+2
China	0.08	.701	53	98	53	0
Peru	0.07	.739	54	80	44	-10
Oman	0.03	.725	55	89	49	-6
Indonesia	-0.05	.681	56	105	56	0
El Salvador	-0.12	.674	57	107	57	0
Honduras	-0.19	.641	58	114	61	+3
Zimbabwe	-0.20	.560	59	130	71	+12
India	-0.24	.545	60	132	72	+12
Botswana	-0.27	.609	61	122	66	+5
Egypt	-0.28	.616	62	120	64	+2
Gabon	-0.31	.607	63	124	67	+4
Nicaragua	-0.32	.616	64	121	65	+1
Guatemala	-0.32	.624	65	117	63	-2
Bolivia	-0.36	.652	66	112	60	-6
Paraguay	-0.37	.730	67	84	49	-21
Namibia	-0.38	.638	68	115	62	-6
Morocco	-0.41	.582	69	126	68	-1
Kenya	-0.42	.519	70	136	76	-15
Bangladesh	-0.50	.440	71	150	86	+15
Vietnam	-0.55	.664	72	110	58	-14
Cote^dIvoire	-0.68	.422	73	154	90	+17
Pakistan	-0.75	.508	74	138	78	+4
Ghana	-0.81	.544	75	133	73	-2
Lao PDR	-0.85	.491	76	140	79	+3
Gambia	-0.85	.391	77	163	98	+21
Tanzania	-0.86	.421	78	156	92	+14
Nepal	-0.87	.436	79	144	82	+3
Cameroon	-0.92	.536	80	134	74	-6
Yemen	-0.96	.449	81	148	85	+4
Nigeria	-0.99	.456	82	146	83	+1
Malawi	-1.00	.399	83	159	94	+11
Gunica	-1.02	.398	84	161	96	+12
Senegal	-1.03	.426	85	153	89	+4
Togo	-1.03	.469	86	143	81	+5
PNG	-1.08	.570	87	129	70	-17
Sudan	-1.09	.475	88	142	80	-8
Congo	-1.10	.533	89	135	75	-14
Lesotho	-1.11	.582	90	127	69	-21
Benin	-1.15	.421	91	155	91	0
Burundi	-1.16	.324	92	170	102	+10
Cambodia	-1.17	.514	93	137	77	-16
Haiti	-1.20	.430	94	152	88	-6
Zambia	-1.27	.431	95	151	87	-8

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Table 2.3 (continued)

Countries	PC Score	HDI Score	PC Ranking	HDI Ranking	Relative HDI	Difference
Burkina Faso	-1.35	.304	96	171	103	+7
Uganda	-1.36	.404	97	158	93	-4
Madagascar	-1.38	.453	98	147	84	-14
Chad	-1.54	.393	99	162	97	-2
Mali	-1.55	.375	100	166	99	-1
Mozambiqu	-1.59	.341	101	169	101	0
Angola	-1.60	.398	102	160	95	-7
Gunica Bissau	-1.64	.343	103	168	100	-3
Niger	-1.66	.298	104	173	105	-1
Ethiopia	-1.79	.298	105	172	104	-1
Sierra Leone	-1.80	.254	106	174	106	0

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Table 2.4: Data of Selected Countries for Comparison

Countries	Safe water (%)	Sanitation (%)	TFR	Life expectancy	GER	Real GDP per Capita ($ppp)
Philippines	86	77	3.6	66	78	2762
Syrian Arab Republic	85	78	4.0	69	64	5374
Ecuador	70	64	3.1	70	72	4602
Sri Lanka	57	63	2.3	73	66	3408
S.Arabia	93	86	6.2	70	56	6091
Brazil	72	41	2.4	67	72	5928
S. Africa	70	46	2.9	65	81	4334
China	90	21	1.9	70	58	2935
Peru	60	44	3.1	68	81	3940
Oman	82	79	7.0	71	60	1977
Indonesia	62	51	2.6	65	62	3971
El Salvador	55	68	3.5	69	55	2610
Hondurus	65	62	4.5	67	60	1977
Zimbabwe	74	58	3.9	56	68	2135
India	81	29	3.1	63	56	1422
Botswana	70	55	4.3	51	71	5611
Egypt	64	11	3.3	65	69	3829
Gabon	67	76	5.0	55	60	3766
Nicaragua	61	31	4.0	68	62	1837
Guatemala	60	66	4.6	66	46	3682
Bolivia	60	44	4.4	61	66	2617
Paraguay	42	30	3.9	71	62	3583
Namibia	57	34	4.9	56	84	4054
Morocco	52	40	3.3	66	46	3477
Kenya	53	77	4.6	58	55	1438
Bangladesh	79	35	3.4	58	39	1382
Gambia	76	37	5.3	53	34	948
Madagascar	29	3	5.7	58	33	673
Lesotho	18	6	4.6	58	56	1290
Cotc^dIvoire	72	54	5.1	54	39	731
Cambodia	13	41	4.6	53	58	1110
Uganda	34	57	6.7	43	34	1483

Source: Human Development Report 1999 and World Development Indicators 1998

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Table2.5: Group of Countries Placed in Higher and Lower Position According to PCA

Higher Position	Lower Position
Austria	USA
Switzerland	Sweden
Netherland	Belgium
Finland	UK
Denmark	Australia
Italy	Israel
Spain	Chile
Singapore	Uruguay
Greece	Argentina
Portugal	Trinidad &Tobago
UAE	Thailand
Poland	Dominican Republic
Beralus	Ecuador
Mauritius	Saudi Arabia
Bulgaria	Brazil
Hungary	Peru
Croatia	Oman
Malaysia	Guatemala
Turkey	Bolivia
Tunisia	Paraguay
Romania	Namibia
Ukraine	Morocco
Jordan	Kenya
Mexico	Vietnam
Jamaica	Ghana
Syrian Arab Republic	Cameroon
Sri Lanka	PNG
South Africa	Sudan
Hondurus	Congo
Zimbabwe	Lesotho
India	Cambodia
Botswana	Haiti
Egypt	Zambia
Gabon	Uganda
Nicaragua	Madagascar
Bangladesh	Chad
Cote^d Ivoire	Mali
Pakistan	Angola
Lao PDR	Gunica Bissau
Gambia	Niger
Tanzania	Ethiopia
Nepal	Venezuela
Yemen	Columbia
Nigeria	Philippines
Malawi	
Gunica	
Senegal	
Togo	
Burundi	
Burkina Faso	

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Table 2.6:A Comparison of Ranking of Some Selected Countries Based on Scores According to PCA and HDI (using three variables)

Countries	PC Score	PC Ranking	HDI Ranking	Difference
USA	1.76	1	3	+2
Canada	1.69	2	1	-1
Belgium	1.65	3	4	+1
Norway	1.63	4	2	-2
Australia	1.60	5	6	+1
Sweden	1.59	6	5	-1
Netherland	1.57	7	7	0
UK	1.56	8	8	0
France	1.55	9	9	0
Switzerland	1.52	10	10	0
Finland	1.51	11	11	0
Denmark	1.48	12	12	0
Austria	1.45	13	13	0
Italy	1.37	14	14	0
Ireland	1.31	15	15	0
Spain	1.28	16	16	0
Singapore	1.22	17	17	0
Israel	1.17	18	18	0
Portugal	1.05	19	20	+1
Korea	1.01	20	21	+1
Greece	0.99	21	19	-2
Chile	0.81	22	22	0
Argentina	0.75	23	23	0
UAE	0.75	24	25	+1
Uruguay	0.69	25	24	-1
Trinidad & Tobago	0.65	26	27	+1
Poland	0.63	27	26	-1
Hungary	0.60	28	28	0
Panama	0.54	29	30	+1
Beralus	0.53	30	36	+6
Mauritius	0.51	31	35	+4
Venezuela	0.51	32	29	-3
Mexico	0.47	33	31	-2
Malaysia	0.46	34	33	-1
Bulgaria	0.46	35	37	+2
Philippines	0.45	36	41	+5
Columbia	0.44	37	34	-3
Croatia	0.43	38	32	-6
Ukraine	0.42	39	51	+12
Romania	0.40	40	39	-1
Ecuador	0.38	41	40	-1
Brazil	0.37	42	43	-1
Peru	0.37	43	44	+1
Thailand	0.34	44	38	-6

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Table 2.6 (continued)

Countries	PC Score	PC Ranking	HDI Ranking	Difference
Sri Lanka	0.32	45	50	+5
Dominican Republic	0.28	46	47	+1
Jamaica	0.27	47	45	-2
Paraguay	0.24	48	46	-2
Jordan	0.24	49	52	+3
S.Africa	0.21	50	54	+4
China	0.17	51	53	+2
S.Arabia	0.13	52	42	-10
Turkey	0.10	53	47	-6
Oman	0.09	54	49	-5
Tunisia	0.07	55	55	0
Vietnam	0.07	56	58	+2
Indonesia	0.06	57	56	-1
El Salvador	0.01	58	57	-1
Bolivia	-0.01	59	60	+1
Syrian Arab Republic	-0.02	60	59	-1
Namibia	-0.05	61	62	+1
Honduras	-0.16	62	61	-1
Egypt	-0.20	63	64	+1
Nicaragua	-0.23	64	65	+1
Botswana	-0.34	65	66	+1
Zimbabwe	-0.37	66	71	+5
Lesotho	-0.39	67	69	+2
Congo	-0.42	68	75	+7
Guatemala	-0.43	69	63	-6
Gabon	-0.53	70	67	-3
Cambodia	-0.59	71	77	+6
India	-0.60	72	72	0
Kenya	-0.60	73	76	+3
Morocco	-0.60	74	68	-6
Ghana	-0.65	75	73	-2
PNG	-0.66	76	70	-6
Cameroon	-0.68	77	74	-3
Lao PDR	-0.71	78	79	+1
Nigeria	-0.83	79	83	+4
Malawi	-0.84	80	94	+14
Pakistan	-0.85	81	78	-3
Togo	-0.85	82	81	-1
Nepal	-0.86	83	82	-1
Yemen	-0.94	84	85	+1
Zambia	-0.95	85	87	+2
Madagascar	-1.04	86	84	-2
Tanzania	-1.05	87	92	+5
Sudan	-1.07	88	80	-8

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Table 2.6 (continued)

Countries	PC Score	PC Ranking	HDI Ranking	Difference
Bangladesh	-1.15	89	86	-3
Angola	-1.18	90	95	+5
Uganda	-1.20	91	93	+2
Benin	-1.21	92	90	+2
Cotc^dIvoirc	-1.29	93	91	-2
Senegal	-132	94	89	-5
Haiti	-1.33	95	88	-7
Chad	-1.35	96	97	+1
Gambia	-1.41	97	98	+1
Mali	-1.47	98	99	+1
Gunica	-1.53	99	96	-3
Gunica Bissau	-1.55	100	100	0
Mozambique	-1.58	101	101	0
Burundi	-1.63	102	102	0
Ethiopia	-1.71	103	104	+1
Sierra Leone	-1.80	104	106	+2
Burkina Faso	-1.91	105	103	-2
Niger	-1.96	106	105	-1

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Table 2.7: Eigenvalues of the Correlation Matrix and Cumulative Proportions (using three variables)

Components	Eigenvalue	Proportion	Cumulative
Prin1	3.2262	0.8065	0.8065
Prin2	0.3900	0.0975	0.9040
Prin3	0.2555	0.0638	0.9679
Prin4	0.1282	0.0320	1.000

Table 2.8: Component Loadings (using three variables)

Variables	Component 1
Real GDP per capita ($PPP)	.476
Adult literacy rate	.503
Gross enrolment ratio	-.517
Life expectancy	-.503

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Chapter Three

DEVELOPING AN INDEX OF POVERTY FOR 64 DISTRICTS OF BANGLADESH

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3.1. Introduction

The socio-economic development in different parts of Bangladesh has undergone important changes in many respects since independence. The process of changes has been however, uneven in terms of its impact on different districts or regions of the country. Many districts are still characterised by low degree of urbanisation and industrialisation, low level of development in agriculture, low improvement in education , health services, infra-structural facilities and other related factors. The incidence of poverty also varies significantly from one district to another with great variation in the availability of basic needs between districts . Development programmes on various sectors are being taken through different Five Year Plan in order to improve the quality of life of the common masses and reduce the regional disparities in the pace of overall development. During the last twenty five years, government spent hundreds of billions of Taka through the various bilateral and multilateral agencies in different socioeconomic sectors. Hence question arises regarding the extent of progress made in each district and the level of development of each district in terms of availability of basic needs and reduction of poverty (BBS, 1998, p: 1)

As mentioned earlier, there are several approaches for measurement of poverty and determination of poverty line which have been discussed in related literature and these different approaches can be criticized, visualized and defined from any angle depending on the critic's perspective and purpose. But there is no unique ideal approach for

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measuring them. Besides income, access to basic needs and services is an important determination of the level of living . The provision of basic needs such as food, education, health services, safe drinking water, shelter, basic facilities in the households are essential for poverty alleviation because the living conditions of the poor are worsened by the absence of these facilities in their households (BBS, 1998, p: 50). However, a number of development programme have been taken up in a country to improve the quality of life by providing basic needs. But development is a multidimensional process and its impact cannot be measured fully by any single indicator. Moreover, a number of indicators when analysed separately or individually will not give an integrated and comprehensive picture of reality .Hence the need for constructing a composite index.

The design of Bangladesh economy comprising 64 districts is examined here in terms of both human development and economic growth. Human development presently assumes importance as several studies reveal that income alone is not always a satisfactory measure of welfare whereas human development takes account of income as well as quality of life factors such as education, health etc. The level of human development of a region reveals how the income is put to use and how people actually live (Bhattacharya, 1998, p: 3028).. It has come to be realised that there is no automatic relationship between any particular level or rate of growth of GNP and improvement in quality of life (Morris and Mc Alpin 1982, cited in Bhattacharya, 1998)). It is also revealed in UNDP study that the level of GNP does not necessarily indicate the level of human development. A study by Majumder (1994) on Asian poverty also reveals that although China is at a similar level of GNP per

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capita to that of India and Pakistan, has a much better performance in terms of quality of life; per capita GNP, therefore, cannot be taken as a surrogate for performances in quality of life.

Since human development includes several factors contributing towards human welfare, measuring human welfare poses a great problem. Several attempts have been made in this direction (Morris and McAlpin 1982; Mukherjee et al. 1981, cited in Bhattacharya, 1998). The most recent endeavour in this line of approach is the HDI as formulated by UNDP to measure relative deprivation in overall perspective. Among many indicators to measure relative deprivation, three types of deprivation are brought into focus: people's deprivation in life expectancy, literacy and income for a decent life to represent longevity, knowledge and command over resources respectively.

It should be mentioned here that in 1996, with a view to analyse inter-district variation in human development attainment, the procedure similar to computation of aggregate HDI was applied on 64 districts of Bangladesh and the study was undertaken by UNDP (1996). The study included only 3 variables like literacy rate and mean years of schooling for estimating educational attainment, district level life expectancy as health component and district level per capita income to measure standard of living. Since life expectancy figure at the district level was not available at that time, but only IMR figure at the district level was available, the national life expectancy figure was treated with disaggregated mortality rate to obtain district level life expectancy figures. Assuming

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average mortality equals to one, a score for each of the districts was computed. Later the national life expectancy figure was divided by the scores to obtain the respective district figures on life expectancy. Since information on all the district level PCY was not available, it was assumed that per capita GNP estimates of 20 old districts represent all the new district currently under their respective coverage (on average 3 to 4) and a factor was computed for each new district which was then used on the national real GNP per capita (PPP$) to estimate district level PCY. As the author himself argues, such assumption leads to a systematic bias in district -wise income disparity estimates. However, operating on the above data base, district level HDIs were estimated.

The present study attempts to derive an index of poverty applying Principal Component Analysis for each 64 districts based on variables representing human development and economic growth which are then compared with HDI estimates as done by UNDP (1996).

3.2. Data and Variables

Some alterations in the construction of the index have to be made as all the relevant data at the districts are not available. The components chosen here for deriving the index are literacy rate , life expectancy, per capita income, sanitation (percentage distribution of

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households by type of toilet, both kuncha and open field), electrification (percentage distribution of households without electricity) and employment (percentage distribution of population by type of works, both agriculture and non-government employees).

It is to be noted that these factors reflect people oriented development factors which have profound influence on district level development. The selection of these variables has been done on the following basis:

As in HDI, PCY is used as a proxy measure for satisfaction derived from a bundle of basic goods and services. It is used as a measure of standard of living of the people. The educational attainment which is the basis for human development and the most important indicator of human welfare is measured by literacy rate (7 years and above). Life expectancy reflects progress made in such fields as health child mortality and nutrition. In addition to these three variables, the other four variables have been selected on the following basis:

In Bangladesh, different policies are launched to bring growth with social justice. Besides, policies directly related to the enhancement of production and productivity, a number of programmes are undertaken to improve entitlement, capabilities and social opportunities. The land reform measures, employment generation programmes can be listed under entitlement related instruments. For lack of data on land reform measures, only data on employment of population in two types of works have been chosen at the district level to

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represent entitlements. Mass literacy campaign, health for all drive are expected to improve capabilities and life expectancy at the district level combined with sanitary conditions are taken to represent improvements in human capabilities or human deprivation. As the data on safe drinking water does not seem to be accurate, this important variable has been dropped from the analysis (although 79% of population in Bangladesh is estimated to have access to safe drinking water, the information on what percentage of population are affected by contaminated water due to arsenic is not available). And finally, the development of social infrastructure like local roads, rural electrification etc. can expect to contribute towards better social opportunities. Due to lack of information on others, only data on electric supply at district level have been chosen to represent social opportunities.

Data have been taken from Analysis of Basic Needs Dimension of Poverty, Vol. III, published by BBS in 1995. The data for TFR has been taken from Progotir Pothey published by UNICEF in 1997.

3.3. Results

The results (shown in Table 3.1 and Table 3.2) derived from PCA are then compared with HDI scores and analyzed in details. Table 3.1 shows the respective component

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loadings. From this Table, we see that component 1 which accounted for about 60 percent of the total variance is dominated by human development and economic factors such as percentage distribution of household employed in non-governmental organisation, persons employed in agriculture, electricity and sanitation. Using the first component, component scores for 64 districts have been computed which are shown in Table 3.2. From Table 3.2 we see that there are marked differences in two types of ranking and the differences ranges from 0 to 47. This difference is expected since the present study considers more as well as different type of variables compared to those considered to estimate HDI. To test the degree of association between two types of ranking, Spearman's rank correlation has been estimated. The estimated rank correlation is .47 which shows that there is general agreement between two types of ranking . By testing the significance of the association, it has been found that the correlation between the two methods is significant. However, the difference in two types of ranking is due to differences in the number and type of variables selected. As mentioned earlier, this difference is expected since in PCA, seven variables have been chosen while in constructing HDI, only three variables have been selected to reflect human progress. From the comparison of the rankings, the highest difference is found in case of Habiganj which was placed in 58th position according to HDI estimates while it was placed in 11th position in case of PCA ranking. This was followed by Cox's Bazar which was placed in 64th position according to HDI ranking while it was placed in 18th position according to PCA ranking. The differences are also higher in case of Joypurhat, Rajbari, Pabna,

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Khagrachari, Thakurgaon, Tangail, Chuadanga, Sylhet, Bhola, Rangamati, Magura, Natore and Munshiganj (differences are more than 20). Analysis show that according to HDI estimates, Joypurhat was placed in 11th position which was placed in 52nd position according to PCA. Available data show that according to PCA, literacy rate and percentage of people working in non-governmental organisation are much higher in Habiganj compared to those in Joypurhat. On the other hand, Joypurhat is characterised by low sanitary facilities, higher percentage of people without electricity and higher percentage of people working in agriculture and lower life expectancy compared to Habiganj. It is to be mentioned here that in the present case PCA gave much weight on the variables representing percentage of people working in non-governmental organisation, percentage of people working in agriculture and percentage of people who do not have any electric supply .

Secondly, according to PCA, Cox's Bazar was placed in 18th position while Barguna was placed in 18th position according to HDI estimates and it placed Cox's Bazar in the 64th position. The last position was secured by Kurigram according to PCA which was placed in 51st position according to HDI estimates. Available data show that Cox's Bazar has much higher PCY, higher life expectancy and literacy rate as well as higher percentage of people working as non-government employees compared to both Barguna and Kurigram. Probably the higher percentage of people in agriculture, higher percentage of people without electricity and lower sanitary facilities and low PCY in Kurigram placed it in such a lower position.

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From Table 3.2, we see that Munshiganj, Pabna, Chuadanga, Sylhet and Tangail were placed in much higher position according to PCA ranking compared to HDI ranking. While Khagrachari, Thakurgaon, Rangamati, Natore and Magura were placed in lower position according to PCA compared to HDI estimates. But available data shows that the districts placed in higher position according to PCA have higher life expectancy, low proportion of people engaged in agriculture and have higher literacy rate compared to the districts which were placed in lower position according to PCA estimates. The results clearly shows that PCY is not a major factor explaining human progress and as mentioned earlier the variable representing proportion of population engaged in agriculture as well as proportion of people engaged in non-governmental organisation explained much of variation in the total data.

3.4. Conclusion

It is evident from the findings of the present analysis that PCA gives better results than HDI in determining ranks because exact values of each variables have been used in the present case to derive the component scores. Therefore PCA can give better results compared to HDI if the data is accurate. As mentioned earlier, PCA can take into more variables in order to increase the explanatory power of the index for development. Since PCA takes into more variables than HDI, even a small changes in scores attributable to other factors besides the major factor, can be clearly shown in the result. In a sense, the

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principal components account for all of the variations in the original data. The main advantages of PCA over HDI have been discussed in details in the previous chapter. Besides, the limitations of HPI in constructing the index of human poverty have also been discussed in details in the previous chapter. Using the concept of HPI, the latest index of human poverty has been calculated for 64 districts of Bangladesh by BIDS. The analysis shows that if one considers HPI value over 45% as the indicator of 'worst performance', then the most deprived districts are Bandarban and Jamalpur in the group of 50.1%+, followed by Rangamati, Sherpur and Nilphamari in the group of 45.1-50%. Other districts with HPI value higher than the country average are Khagrachari, Sunamganj, Mymenshingh, Rajbari, Shariatpur, Kurigram, Lalmonirhat, Nawabganj, Pabna, Rangpur, Sirajganj and Thakurgaon. Dhaka and Mymenshingh appear to be frontrunners with HPI value lower than 30%. But the results based on PCA shows that although Dhaka captures the highest position, Mymenshing falls in the lower value according to PCA score which is in sharp contrast to HPI results. According to HPI, the lowest value is captured by Bandarban and Jamalpur while according to PCA, Kurigram captured the lowest position among 64 districts, Jamalpur being among the lowest category districts. The HPI results shows that Kurigram has the HPI value higher than the country average. But available data shows that Kurigram has the higher percentage of people in agriculture, higher percentage of people without electricity, lower sanitary facilities etc. than Bandarban and Jamalpur which placed it in the lowest position. It is to be noted here that the present study considers more variables in addition to the variables used in constructing HPI to calculate the ranks for 64 districts in Bangladesh. Therefore given the limitations of HPI

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as discussed in previous chapter, we can conclude that PCA is a better measure than HDI and HPI to reflect human progress and shows many aspects of human experience.

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Table 3.1: Component Loadings (for 64 Districts)

Variables	Component Loadings
Per Capita Income	-0.350
Sanitation	0.408
Electricity	0.418
Literacy	-0.395
Agriculture	0.425
Non-government employee	-0.446
Life expectancy	-0.042

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Table 3.2: A Comparison of Ranking of 64 Districts of Bangladesh According to PCA and HDI

Districts	PC Score	PC Ranking	HDI Score	HDI Ranking	Difference
Dhaka	-4.520	1	.459	1	0
Narayanganj	-2.760	2	.375	17	+15
Chittagong	-2.318	3	.391	10	+7
Feni	-1.584	4	.405	7	+3
Chandpur	-1.385	5	.435	4	-1
Bogra	-1.227	6	.362	23	+17
Munshiganj	-1.202	7	.343	32	+25
Comilla	-1.183	8	.385	13	+5
Khulna	-1.006	9	.445	3	-6
Barisal	-0.744	10	.370	20	+10
Habiganj	-0.723	11	.294	58	+47
Pirojpur	-0.351	12	.404	8	-4
Jessore	-0.331	13	.360	25	+12
Patuakhali	-0.327	14	.379	14	0
Pabna	-0.327	15	.308	50	+35
Narshindi	-0.316	16	.365	21	+5
Tangail	-0.290	17	.300	55	+38
Cox's Bazar	-0.283	18	.238	64	+46
Jhalokhati	-0.262	19	.407	6	-13
Naogaon	-0.206	20	.329	39	+19
Bagerhat	-0.188	21	.447	2	-19
Gazipur	-0.181	22	.353	29	+7
MaulaviBazar	-0.181	23	.350	31	+8
Gopalganj	-0.179	24	.414	5	-19
Noakhali	-0.107	25	.378	15	-10
Madaripur	-0.051	26	.355	28	-2
Barguna	-0.019	27	.393	9	-18
Lakshmipur	0.017	28	.358	26	-2
Chudanga	0.056	29	.296	57	+28
Sylhet	0.116	30	.298	56	+26
Dinajpur	0.181	31	.335	36	+5
Satkhira	0.194	32	.372	19	-13
Kisoreganj	0.197	33	.330	38	+5
Narail	0.232	34	.375	16	-18
Bhola	0.269	35	.287	59	+24
Manikganj	0.279	36	.321	43	+7
Faridpur	0.280	37	.356	27	-10
Rajshahi	0.309	38	.351	30	-8
Rangamati	0.330	39	.387	12	-27
Magura	0.400	40	.337	34	-6
Jenaidah	0.466	41	.305	47	+6
Kushtia	0.497	42	.305	53	+11
Sunamganj	0.507	43	.314	48	+5
Natore	0.520	44	.364	22	-22
Mymenshing	0.564	45	.285	60	+15

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Table 3.2: A Comparison of Ranking of 64 Districts of Bangladesh According to PCA and HDI

Districts	PC Score	PC Ranking	HDI Score	HDI Ranking	Difference
Sariatpur	0.592	46	.317	44	-2
Meherpur	0.598	47	.316	45	-2
Bandarban	0.613	48	.322	41	-7
Rajbari	0.670	49	.374	18	-31
Gaibandha	0.702	50	.340	33	-17
Shirajganj	0.709	51	.336	35	-16
Joypurhat	0.749	52	.389	11	-41
Nawabganj	0.806	53	.325	40	-13
Brahman Baria	0.932	54	.312	49	-5
Khagrachari	0.946	55	.360	24	-31
Netrokona	0.956	56	.306	52	+4
Sherpur	0.974	57	.245	63	+6
Lalmonirhat	0.979	58	.316	46	-12
Rangpur	0.012	59	.283	61	+2
Jamalpur	1.049	60	.322	42	-18
Nilphamari	1.049	61	.248	62	+1
Thakurgaon	1.094	62	.331	37	-25
Panchagar	1.109	63	.301	54	-9
Kurigram	1.295	64	.306	51	-13

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Chapter Four

LINKAGE BETWEEN POVERTY, HUMAN RESOURCE DEVELOPMENT AND ECONOMIC GROWTH: AN INTEGRATED MODEL FOR DEVELOPING COUNTRIES

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4.1. Introduction

"During the post-war period many countries of Asia, Africa and Latin America that have undergone through the process of liberalization, privatization and globalization as well as social controls and nationalization realized that their political freedom could carry little significance unless it was accompanied by freedom from misery and poverty" (Joshi, 1997). It was also felt in a 1997 Conference for International Peace and Security programmes that globalization and integration of developing countries into world economy alone are not sufficient to eradicate poverty or even adequately address poverty. Indeed, under some conditions, globalization can exacerbate poverty.

However, the current turmoil in the world capital and financial markets seem to have turned the attention of world leaders and institutions from maximising GDP growth and profits to a more egalitarian world. The focus is once again on social welfare and human development. There is a realization that without human development and increased social welfare it may not be possible to sustain the march towards globalization. The 1998 United Nations Report on LDCs, for instance, says that one reason for backwardness of the developing countries is the poor progress made by them in human resource development (Anonymous, 1998c).

Poverty eradication actually requires a concerted efforts of the state, market and international assistance. While international poverty is undeniably a persistent problem, our knowledge of how to tackle global poverty and our ability to do so has changed

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substantially over the last fifty years, as the global economic environment. However, this international issue is barely visible on the agendas of industrialized nations whose attention and resources will continue to be essential in the fight against poverty. For these reasons the problem of poverty remains a key international challenge warranting reassessment and invigorated attention (Sullivan, 1999).

Poverty is a multidimensional phenomenon defined and explained as a situation in which a person lacks the necessary capabilities and entitlements to satisfy his or her basic needs and aspirations. However the poverty definition used in the present study considering 74 developing countries is the $1 per population per day.

Three basic approaches to poverty alleviation relating human development have been identified: one approach primarily relies on market-based growth and to take care of those who fall through the cracks of market process with targeted public welfare programmes and provision of infra-structural facilities. This approach is known as 'safety net' approach and is popular in some multilateral lending agencies like World Bank/IMF and donor countries. Another approach stresses the importance of massive public interventions indirectly improving health, education and nutrition of the poor. A third approach relies more on local self-governing institutions and community involvement to improve the material conditions and autonomy of the poor. This approach is based on the philosophy of self-help underlying Grameen Bank of Bangladesh and of effective decentralization (Samal, 1998, p: 1846). **This study focuses mainly on the second approach as this**

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represents an integrated and balanced means to elimination of poverty in developing countries and offers a useful framework to which to examine poverty alleviation. More specifically, the present study makes an attempt to identify the determinants of poverty as well as to explore the possible linkages between poverty, economic growth and human development in case of 74 developing countries by focusing on three basic components of human development: education, health and nutrition.

4.2. Background of the study

The study uses only three components of human development because various components of human capital are interrelated and the objective of the present study is to look at the linkage between different components of human development, economic growth and poverty reduction. Also the three components of human development have been used in the present case as a tool of empowerment of poor defined as a means of the quality of life of the poor. The UNDP poverty Report 1998 (1998, p: 38) states that a more basic form of empowerment of poor is to build up their human capabilities--- for example by promoting literacy, improving nutrition or enhancing health. It is to be noted that goverments, NGOs and other institutions do not empower people; people empower themselves. But through policies and actions governments can create a supportive environment to uplift them (UNDP, 1997, p: 96). For the poorest, these interventions are often the most critical and the most valued. This is because improvement in health,

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nutrition and education can lengthen the time horizon of the poor and strengthen their ability to analyse the causes and consequences of poverty with which they are victims (UNEP, 1995, p: 122). As Sen (1997, p:146) observes, expansion of health care, education and social security etc. contribute to the expansion of human capabilities. There is every evidence that even with relatively low income, a country that guarantees health care and education to all can actually achieve remarkable results in terms of the length and quality of life of the entire population.

Human development involves both the process of investment in human capital (supply-side) and participation of human beings in the benefits of development (demand-side). A distinctive feature of human development strategy is the emphasis on human capital formation. And an essential feature of human development paradigm is productivity which requires investment in people and an enabling macro-economic environment for them to achieve their maximum potential. Economic growth is therefore a subset of human development needs----an essential part but not the entire structure (Huq, 1995, p:19). This does not mean that additions to the stocks of natural and physical are ignored, but it does mean a major change in priorities in favour of human capital. The justification for this change in priorities is, first, that the returns on investing human capital and in general are as high as returns to other forms of investment; second that investment in human capital in some cases economises on the use of physical capital and the exploitation of natural resources and third, the benefits of investing in people are in general more evenly spread than the benefits from other forms of investment. Thus a greater emphasis on human

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capital formation should result in a faster pace of development, more sustainable development and a more equitable distribution of the benefits of development (Griffin and Meckenly, 1994, p: 4). The human development approach based on education, health and nutrition is also cost effective in the sense that even the poorest countries can afford improvement in human capital and this makes them cheaper in poorer countries because of lower wages (Anonymous, 1998c).

Human capital which is the source of knowledge and hence technical knowledge, overcomes the limitations imposed on growth by diminishing returns to other inputs like labour and capital. In addition, "human capital is shown to promote growth and development through significant externalities of knowledge stock by increasing the productivity of labour and capital, by providing the pool for the emergence of employment who implement and diffuse inventions and innovations and by promoting agglomeration of mature and growth firms and encouraging quality over quantity of children as fertility rates decline" (Mathur, 1999, p: 203).

4.3. Weaknesses of other Approaches

The following issues deserve special attention while planning for poverty removal through the present approach:

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It has been observed recently that although market oriented reforms have characterized the whole world economy, there has been fresh controversy regarding the impact of market-oriented reform on poverty. While developing nations like Argentina and to some extent China have succeeded in reducing poverty by introducing market oriented reforms, the conditions in Mexico, Brazil and Philippines show that such reforms cannot do much headway in reducing poverty necessiating a growing need for public intervention. In other words, it has been argued by some that the unwanted side effects of market-oriented reforms can be overcome only if there are state-initiated reforms and programs for poverty alleviation (Joshi, 1997). Thus when so much is being spoken about market-oriented reforms, there is strong case for human development strategy, a strong argument in favour of the increased role of the state n the implementation of this strategy and reallocation of public sector resources in favour of such a strategy.

Over the past 20 years, enormous NGOs have been working in areas of education and health, especially among disadvantaged groups, environmental movements and also in other areas like peace, democracy, human rights, gender equity and poverty. The UNDP estimates that the total number of people touched by NGOs in developing countries across the world is probably 250 million and this will rise considerably in the years ahead. It has been observed that although the NGOs have been appreciated as suitable agencies for promoting human development, in most of the cases there has been a serious mismatch between objectives and activities of NGOs. There is also a genuine complaint that a majority of the NGOs do not have any clear cut strategies with regard to building of target

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group organisations, withdrawal and role transformation, linkages with government and its agencies and networks (Joshi, 1997).

Many government programmes are also intended to benefit the poor to some extent. Many such programmes combine infrastructure provision or maintenance with employment generation. Although a number of substantial programmes perform a safety net function for the poor, it is clear that many governments have not succeeded in any fundamental restructuring of society which could tackle the roots of poverty. A major reason for this basic failure of government programme to deliver their intended improvements to the life style of the poor is the close linkage between rural elite and government. Government in many developing countries have little capacity to actually implement improvements for the rural poor through safety net, since it largely lacks the will or the means to disempower the rural elites. Moreover, such programmes are subjected to criticism for failing to reach the most needy, for widespread corruption and misappropriation of benefits and for providing benefits to landed than landless (Netherlands Ministry of Finance, 1998, p: 50).

However, the third approach, that is local authority and community approach is based on the philosophy of self-help underlying Grameen Bank of Bangladesh and of effective decentralisation. The sutdy by Goetz and Gupta (1996) shows that the special credit programmes which are justly famous in Bangladesh for their capacity to reach the poor have had notable success in overcoming institutional barriers to lending women, although with important exception of Grameen Bank, these programmes were initially slow to

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address the needs of rural women borrowers. Their study also shows that women borrowers were more likely to retain full control over loan use when they were widowed, separated or divorced. Further, as Mozumder (1994, p: 94) argued that although the Grameen Bank method of administration seem to have been a success story, basically it is on a small scale probably would not survive a large expansion of scale. The main cause for this is the limitation it may face from the demand side. As more and more members engage in the same income generating activities the prices of their goods and services will be depressed unless the market can be enlarged. The study by Rahman and Islam (1993) shows that although the bank is successful and performing better than other specialised credit programmes in Bangladesh, it is not the perfect organisation. The primary concerns are high operational costs and dependency on borrowing from external sources. And there is a feeling that since the bank is personality-based experiment it may not show similar success in the absence of its founder. The study by Haan and Lipton (1998) shows that there is a confusion between credit (often for consumption), support for enterprise and poverty reduction in the sense that cost effective ways to improve one of these often do little or nothing to achieve the others. Also that members of the group may not want the poorest to join them as they could be a poor credit risk and therefore enterprise credit is not a successful way of addressing the problem of the very poorest. It was also argued that main drawback of many credit schemes is that they are advanced whether or not the locality offers a promising uses of the credit. Many observers pointed out that total eradication of poverty has not taken place in the villages where Grameen Bank (GB)and micro credit NGOs have been operating for decades. It was also pointed out that while

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micro credit operations have been successful on a micro level (GB is highly effective in reaching only 40% because of self-selection rule imposed through its program design), it is not likely to lead to an overall economic development, because overall economic development requires a macro approach which includes heavy industrialization and modernisation of agriculture (Daily Star, 1998). It is therefore argued that GB has mainly focused on and become successful in poverty reduction at the micro-level.The lack of attention to macro-institutional process was identified as the missing element in Yunus' approach by many (http://www.dailystarnews.com/1998/27/n8082709). Others argue that availability of credit is just one of the factors in the production process and that the programme is not ideal for all the poor as making money through self-employment is a difficult job which calls for entrepreneurship. And not everyone has this ability. For this reason, only 40% of the eligible household participate. This is why other targeted measures such as income transfer, food for work, broad-based economic growth and improved access to education, health and nutrition are required and should therefore be integrated into other programs of poverty alleviation (Khundker, 1996, p: 119).

A recent study shows that although education is widely used as an indicator of the status of women and is seen in more recent literature as an agent to empower people by widening their knowledge and skills, there is no positive linear relationship between education and many facets of empowerment. The study argued that education has improved the quality of life and the status of women in all countries, in narrow terms and

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that it has not been able to counter the economic and social constraints that perpetuate poverty (Jawaweera, 1997, p: 423). This is true because the education system that is prevalent in most developing countries is mostly book-oriented and does not have any relevance to economic reality. But the present study stresses on the quality of education at all levels (knowledge, skills and abilities) that is relevant to economic activity and social behavior (making the curriculum content relevant). More recently, studies found that there is evidence of skills shortage acting as a constraint on growth. As economies move up the technological ladder, school levers and adults with only a basic education will have a diminishing prospect of finding work in a faster-growing and higher-wage sectors with the wages of the unskilled falling progressively further behind those of the skilled. These problems are already evident in Thailand. After Chile, Thailand experienced the fastest-growing gap between the bottom and top ends of the labour market. This gap expanded by 50 percent between 1987 and 1991, compared to 5 percent in Indonesia, where the government prioritized spending in lower secondary education (http://www.oxfamamerica.org/adovocacy/part3.htm). Also there are important social benefits associated with educational attainment in terms of better public health, lower crime, the environment, parenting, political and community participation and social cohesion although there continues to be debate about the direction of causality (Anonymous, 1998e). For example, knowledge of environment is itself a form of human capital. Education can improve knowledge of environmental costs and also gives the ability to identify the possible source of environmental contamination. Education can also improve knowledge of how to wage successful political struggles—how to lobby

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government officials, initiate legal actions and mobilize public opinion (UNEP, 1995, p: 124).

Actually all programmes and strategies aimed at reducing poverty should depend on knowledge of what causes poverty. To explain poverty dynamic models are required which understands poverty as a process based on functional relationships. The approaches to explaining poverty that have so far been produced by social scientists are only incomplete, however. They do not provide any total explanations of poverty as a result of processes of social development but concentrate on single aspects that contribute to poverty. The present study therefore looks at an ' integrated approach' in identifying the determinants of poverty by focusing on three basic components of human development: education, health and nutrition. The 1997 report on Progress of Nations published by UNICEF rightly states that the day will come when nations will be judged not by their military or economic strength, nor by their capital cities and public buildings, but by their well being of their peoples: by their levels of health, nutrition and education.

The present study although is concerned with the second approach of poverty alleviation in developing countries stresses the fact that in implementing human development strategy both government and market should work as complementary rather than substitutes and not focus on the notions of only government or only market based development. That is, in the provision of social services, the state will need to complement the work of other agents of development especially, NGOs in areas where they have been successful.

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4.4. Data, Variables and Methodology

The analysis uses the data from HDR 1998, Social Indicators of Development 1997, World Development Indicators 1998 and FAO data 1998 (FAOSTAT, TS) and considered 74 developing countries (16 Asian, 39 African and 19 Latin American and Carribean). The list of countries is shown in Annex I (p: 102). The countries are selected on the basis of those countries which have fertility rate greater than 2.1 (those countries which have not yet received replacement level of fertility). This is because 90 percent of the world's population growth occurs in developing countries (over the past 15 years or so, around 100 million people have added annually to world's poor), where it poses serious problems to endeavours to raise people's living standards and to provide them with basic health and educational services as well as other basic needs items. Thus high fertility is causing a serious problem in implementing plan to reduce poverty.

In order to identify the determinants of poverty, the analysis has been divided into two parts. The first consists of forming three equations comprising three basic components of human development: education, health and nutrition. The level of education is measured by gross enrollment ratio at al levels, health is measured by life expectancy and nutrition is measured by daily calorie supply per capita. All these can regarded as priority poverty indicators. The three equations to be estimated are as follows:

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Suppose education as measured by gross enrollment ratio at all levels ratio depends on per capita income (PCY), labour participation rate and public expenditure on education (as % of GDP). Now taking log on both sides we have,

LNGER = f (LNPCY, LNPEEDU, LNLFR)..... (1)

Similarly, health as measured by life expectancy depends on such factors as PCY, sanitation, physician per population, public expenditure on health (as % of GDP). Taking log on both sides we have,

LNLE = f (LNPCY, LNSAN, LNPPP, LNPEH)---------- (2)

And finally, nutrition as measured by daily calorie supply per capita depends on such factors as PCY, total fertility rate and food production. Taking log on both sides we have,

LNDCS = f (LNPCY, LNTFR, LNFD1)----------(3)

where LNGER=log of gross enrollment ratio at all levels, LNPCY=log of total fertility rate GNP, LNTFR = log of total fertility rate, LNPEEDU=log of public expenditure on education (as %of GNP), LNLE= log of life expectancy, LNPPP= log of physician per population, LNSAN=log of percentage of population having access to sanitation, LNDCS= log of daily calorie supply per capita, LNPEH=log of public expenditure on health (as %of GDP), LNLFPR=log of labour force participation rate, LNFD1=log of food production.

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Each of these equations has been estimated by multiple regression. Separate regression has been done by including regional dummies for Latin America and Africa taking Asian countries as a reference category. It should be mentioned here that multiple regression models for the above three cases were considered with different explanatory variables and finally the present set of variables have been selected because these variables explain most of the variations in the level of poverty compared to other variables. In the second regression model, where life expectancy is the dependent variable, the variables sanitation and public expenditure on health which were insignificant were not dropped from the model because of their hypothesized linkage with increased life expectancy.

For the second part, all the variables (both dependent and independent) of three equations have been incorporated in a single model. In other words, this is an integration of three components in a single model which is then estimated by FACTOR ANALYSIS. The objectives of such integration is to identify the factors associated with each component on the basis of factor analysis. This provides stronger justification for the nature of inter-relationships that determine components of interest and in turn, determine poverty. **This approach can be termed as an integrated approach to poverty analysis.**

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4.5. The Method of Factor Analysis

The present study uses factor analysis mainly because factor analysis attempts to simplify complex and diverse relationships that exist among a set of observed variables by uncovering common dimensions or factors that link together the seemingly unrelated variables and consequently provides insight into the underlying structure of the data (Dillon and Goldstein, 1984).

The use of factor analysis are mainly exploratory and confirmatory depending on the major objectives of the researcher. Since the main objective of the present paper is to determine the minimum number of common factors that can explain the underlying causes of poverty without a prior specification of number of factors and their loadings, the exploratory type of factor analysis is used in the present case.

4.6. Procedure of Data Analysis

An exploratory factor analysis was first conducted to reduce the dimensionality of the data by using computer software SAS. First, factors were extracted by Principal Component Method, then they were rotated to a simple structure with both orthogonal (Varimax) and the oblique (Promax) rotations. Not surprisingly, results from two rotations were quite similar. Analysis was finally based on the results from the most frequently used Varimax rotations. All three results have been summarized in Table 4.1.

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4.7. Result and Interpretation of Finding (First Part)

The result of the first regression shows that per capita income (PCY) and public expenditure on education (as % of GDP) have positive significant impact on the level of education while labour participation rate has negative impact on the level of education. This shows that level of education will increase if per capita income and public expenditure on education increases and that if labour participation rate increases, then enrollment rate will be low. The result of second regression shows that per capita income and physician per population have positive and significant effect on life expectancy. But the result shows that sanitation and public expenditure on health had no significant effect on life expectancy.

The result of third regression shows that PCY and food production have significant effect on daily calorie supply per capita but total fertility rate has negative impact on it. This result is expected since per capita intake of calorie depends both on food production and family size. If food production increases then per capita food intake will increase but if family size increases then per capita calorie intake will go down. These preliminary results clearly indicate that higher PCY along with increased public expenditure on basic social services such as education and access to primary health care by increasing access to physician can reduce the level of poverty to a great extent. The study also shows that decline in TFR can also have significant effect on the level of poverty. Therefore the basic

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determinants identified are lack of income, lack of access to proper health care facilities and high fertility rate. Lack of availability of food also seems to be an important determinant perpetuating poverty. These findings clearly shows that both economic and human development as well as demographic factors are responsible for the causes of poverty and that there is no trade-off among them and that all should be jointly promoted in order to alleviate poverty.

After the inclusion of dummies for Latin America and African countries taking Asian countries as a reference category, it has been found that the results of regression did not alter substantially previous results except that the variable LFPR which was found to be significant in the first regression model (before the inclusion of dummies) become insignificant in the new regression where the regional dummies are included but the sign of the estimation is in the expected (negative) direction. This result is expected since different countries follow different pattern of labour absorption and in some countries the increase in public expenditure on education might not have great impact on labour participation rate. The interpretation of dummies indicate that in case of variables like gross enrollment ratio (GER), life expectancy (LE) and daily calorie supply per capita (DCS) (which are dependent variables), Latin American countries do not vary much with the Asian countries. The reason for this is that the study included only a few Asian countries as well as included some Middle Eastern countries (having high population growth rate) in Asian country (see Annex I). But the results show that African countries have much lower GER and LE compared to Asian countries. And that the inclusion of dummies has increased the

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explanatory power of all three regressions. In the second part, regional dummies are not included since inclusion of dummies would violate the assumption of normality. It should be noted here that in all these models (before and after the inclusion of dummies) life expectancy (second regression model) has been appeared to be the most important indicator of the level of poverty.

4.8. Result: Second part

For the second part, the results of factor analysis identified three factors according the highest loadings explaining about 68 (67.9) percent of the total variance: daily calorie supply per capita, life expectancy, total fertility rate, per capita income, sanitation, gross enrollment ratio, physician per population as a first set of factors and public expenditure on education and labour participation rate as a second set of factors and public expenditure on health and food production as a third set of factors.

Factor 1 (with life expectancy having the highest loadings) accounting for about 44.3% of the variance in poverty level may be interpreted as **basic needs dimension** associated with the level of poverty. Factor 2 with about 13.4 % of the variance was labeled as **basic capability dimension** and the third factor explaining about 10.1 % of the variance can be labelled as **basic entitlement dimension** associated with the level of poverty. Interpretation of each factor has been discussed below.

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First Factor

The present study examined multidimensionality in the determinants associated with issue of poverty. The first factor explaining most of the variables like education, daily calorie supply per capita, doctor per population, sanitation, life expectancy, per capita income and total fertility rate clearly shows that poverty arises in most cases due to the failure to provide such basic needs and therefore it is identified as basic needs dimension associated with the level of poverty. The prime elements of basic human needs are food, clothing, housing, health and education. Now-a-days, some other elements are also added as supplementary elements of basic needs, such as clean water supply, sanitation and people's participation (BBS, 1995, p: 13).

The only demographic variable, total fertility rate is also included in basic needs dimension since there is likely to be a nexus of relationship among education, health, fertility, nutrition and income, each assisting and reinforcing each other. An extensive literature provides solid documentation of the inverse relationship between family size and educational and health status of children. Studies have found high parity and /or close birth spacing to be associated with lower average levels of child nutrient (viz., calorie, protien and calcium) intake, poor nutritional status of children, higher levels of infant and child mortality, smaller per capita health and food expenditures, poorer access to preventive and curative medical care, lower expenditures per child, lower grades for children enrolled in

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school. In general, the negative relationship between family size and indicators of child health, education and development is more pronounced in poor than in non-poor families indicating that poverty exacerbates the adverse effects of large family size (Jha, 1993, p: 8). Lower fertility itself affects the other aspects of poverty. The spread and quality of education increases because both the state and parents can afford to spend more on each child when there are few of them. Large families have higher infant and child death rate and a higher incidence of malnutrition-there is simply less food, money and time for each child (World Bank, 1980, p: 70). It is to be noted here that the variable sanitation which appeared to have no significant effect on life expectancy in the second regression model appeared as significant correlates of life expectancy along with other variables in the first factor. This is because although sanitation alone had no significant effect on life expectancy, recent multivariate studies found explicitly a three way interaction between literacy, life expectancy and sanitation (Grosse and Perry, 1983, p: 217-218).

Second Factor

The second factor includes such variables as public expenditure on education and labour participation rate. These two together have been described as basic capability dimension, because the development of human capabilities is increasingly regarded as a right to which all people are entitled. This right in many societies includes the ability to read and write, access to basic health care and freedom from starvation (Griffin and Knight, 1990, p: 24-

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25). The development of human capabilities should be seen not as an objective with a definitive end-point but as a process continuing in time without end. It is an approach to overall development that puts the well being of people first and that regards human beings simultaneously as both means and ends of social and economic policy. It places considerable emphasis on local mobilization as a way of allowing people to develop their capabilities and on participation as an agent of constructive change (Griffin and Knight, 1990, p: 23).

In fact, there is an important relationship between public expenditure on education and labour participation rate. The LFPR with its highest loading appeared with a negative sign indicating that if government allocates a higher proportion of its expenditure on education, then percentage of population entering the labour market will decline. This is because more people is expected to be enrolled in schools, colleges and other higher institutions (given low cost of education) rather than competing in the job market. Those with higher levels of education are more likely to participate in the labour market, face lower risks of unemployment and receive on average higher earnings (OECD, 1999, p: 54). Lack of education facilities is another cause for the persistence of child labour. In South Asia, the phenomenon is worsened by the fact that schools do not exist, while the state expenditure on education is very low (Pradeep, 1999). But a recent study argues that non-attendance of children in school is not merely due to child labour, at least for the primary school age group, but also due to school system's shortcomings reflecting the inadequacy of the

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school system to attract and keep children in school (Banerji, 2000, p: 795). This analysis leads to the fact that since population growth rate in developing countries is higher, besides increasing the expenditure for basic education, government should make serious efforts to improve teaching-learning conditions in schools to educate the growing labour force adequately so that they can compete in the labour market with higher skills which will increase their capability to earn more.

It is clear that all countries which have managed persistent growth in incomes have also had large increases in education and training of their labour force. Farmers in countries with traditional economies are among the least educated members of the labour force. By contrast, modern farmers must deal with hybrids, breeding methods, fertilizer, complicated equipment and intricate future market for commodities. Education is of great value since it helps farmers adapt more quickly to new hybrids and other new technologies (Becker, 1993, p: 24-25). In Korea, active export-oriented strategy strongly influenced public policy towards human development. Because outward-oriented economies are subject to more pressures from global competition, the government and firms have strong demand for effective education and training system. In Korea, the government by recognizing future demand for a skilled work force for export-oriented industrial development, launched various human resources management programs to meet demand for education. Korea's economic growth has benefited from the education level of its human resources, which have played a key role in absorbing advanced technology from the developed

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countries. However, the rewards from education are higher in a more export-oriented society, where investment in education is required to move to new technologically advanced areas (Lee, 1999).

The recognition that education is a cornerstone of development calls for not only increased allocation of public resources towards education but also for more efficient utilization of existing resources (UNDP, 1998, p: 137). In countries where education budgets are severely constrained, it is time that government of these countries take concentrated efforts to reduce military spending and to maximize the educational output for a given budget.

Third Factor

The third factor involving variables like food production and public expenditure on health has been described as basic entitlement dimension. The entitlement approach to starvation and poverty concentrates on the ability of people to command food through legal means available in the society, including the use of production possibilities, trade opportunities and other methods of acquiring food. According to Sen (1981, p: 45), a person starves either because he does not have the ability to command enough food or because he does not use this ability to avoid starvation. The entitlement approach concentrates on the former, ignoring the latter possibility implying that poverty arises mostly due to inadequate supply of food. More specifically, the entitlements approach concentrates on each person's

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entitlements to commodity bundles including food and views starvation as resulting from a failure to be entitled to a bundle with enough food.

Chronic malnutrition, even if countries where people get enough calories is forcing researchers to take a closer look at the micro nutrient content of the foods produced by agricultural systems. While some developing nations fail to meet the basic caloric needs of their people, it is more alarming that many developing nations and even developed countries fail to provide adequate nutrients to meet essential health and nutritional needs. The consequences of micro-nutrient malnutrition or "hidden hunger" are enormous in terms of a nation's health care costs, lost productivity and sluggish development (Welsch, 1999). Thus as the finding suggests, developing countries must find sustainable ways to produce accessible food supplies of adequate quantity and nutritional quality that promote health and thereby reduce health care costs. Attempting to ensure food security by ensuring availability of food can be seen as an investment in human capital that will make for a more productive society. A properly fed, healthy, active and alert population contributes more effectively to economic development than one which is physically and mentally weakened by inadequate diet and poor health.

As the third factor shows that poverty arising from malnutrition is the result of inadequate expenditure on health in developing countries. About three quarters of all public expenditure on health is for expensive medical care that benefits a small minority of the population living in urban areas. A high proportion of the budget for health, 80 to 90

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percent in some countries is spent on hospitals, almost all of which are located in cities. At the same time, only about 60 percent of the people have access to primary health care. A high proportion of poor and of those living in rural areas, are not reached by the health care system and are forced to rely on home remedies and traditional medicine (Griffin and McKinely, 1994).

Beyond the immediate direct effects of an expanded public health programme, there are longer-term benefits in the form of fewer days lost from work because of illness, a high productivity of labour and increased household income, a part of which can be saved and invested in growth-promoting activities. The adverse consequences of poor health are sometimes irreversible, persisting over an entire lifetime and beyond. Unlike most educational deficiencies which can be corrected later, serious health problems early in life sometimes cannot be corrected in later years and their negative effects on productivity, incomes and general well being can last indefinitely. Indeed the effects of disease and malnutrition can be passed from one generation to the next. For example, low birth-weight and poor nutrition of an infant girl can cause her later as a mother to bear children with low birth weight or poorly developmental capacities. The costs of preventing such things are low and represent an investment in human capital with a high pay-off (Griffin and McKinley, 1994). Thus there is a case for reallocating resources towards low-cost, high-impact primary health care measures (Griffin and Knight, 1990, p: 29).

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Health expenditures of this sort can be justified not only by their effect on people's capabilities to enjoy life, but also by their effect on productivity. There is evidence that dietary energy improvements have an immediate effect on the performance of workers and that supplementation of micro nutrients can have even more dramatic effect on anemic workers. Growth retardation at an early age, caused by dietary deficiency or infection is a powerful mechanism for perpetuating the vicious circle of poverty.

However, Prof Amartya Sen while delivering a lecture on "India: What Prospects?", points out that it is not too difficult for poor countries to spend on health and education along with developmental expenditure. He cites the empirical reality that many poor countries such as Sri Lanka, China, Costa Rica, the Indian State of Kerala and others have done this with commendable success. He further says that delivering public health care and basic educational facilities is enormously cheaper in a poor country than in a rich one. This is because both health and education are both labour intensive activities and this makes them much cheaper in poorer countries because of lower wages. Comparing India with China, Prof. Sen says that widespread literacy coupled with extensive land reforms in China enabled it to gain a widely shared economic expansion (Anonymous, 1998c). But it should be remembered that there is nothing inherently wrong in increasing public expenditure but the question is how well the money is spent, what benefits the citizens

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derive from the increased public expenditures and what it does to the economy (Anonymous, 1998d).

4.9. Conclusion

The present study identified the determinants of poverty in selected developing countries by focusing on three components of human development: education, health and nutrition. The study first analysed the possible determinants of poverty based on three components of human development which are estimated by multiple regression. The basic determinants identified are lack of income, lack of adequate expenditure on education, lack of adequate number of physician, high fertility rate and lack of adequate supply of food. The study then analysed possible dimension of poverty by incorporating all the variables of three components in a single model which is then estimated by factor analysis. The results of three regression models more or less confirm the results of factor analysis. In all three regression models, per capita income (PCY) has been appeared to have significant effect on all three components of human development. In factor analysis also PCY has been appeared in the first factor along with other variables explaining about 44 percent of the variations in the level of poverty. In the first factor, we see life expectancy has been appeared with highest loading and that the second regression model where life expectancy is the dependent variable explains about 79 percent of the variations in the level of poverty compared with the other two models. But public expenditure on health and sanitation

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appeared to have no significant influence on life expectancy in the regression model. Thus public expenditure on health has been appeared in the third factor (in order of priority) which explains only 10 percent of the variation in the level of poverty. The only exception is sanitation which appeared to have no significant influence on life expectancy appeared in the first factor as basic needs factor having strong relationship between life expectancy, literacy, total fertility rate and daily calorie supply per capita.

From regression analysis and factor analysis the study concludes that both human development and economic growth as well as demographic factor are important in explaining the level of poverty and that there should be no trade-off among them and that all should be jointly promoted in the process of poverty alleviation. The main difference of the present analysis from previous analyses of poverty is that it identifies possible dimensions of poverty in order of priority. The most important dimension of poverty has been identified is the basic needs dimension followed by basic capability dimension and basic entitlement dimension respectively. The paper through its integrated approach also shows that there is a strong link between poverty, economic growth, human development as well as demographic factors. Previous studies tried to show such links based only one side. For example, earlier studies related poverty either to economic growth or to human development (Hammer et al, 1997) and there are some studies (UNDP, 1996; Ranis et al. 2000) which show that there is a strong link between economic growth and human development and that both should be jointly promoted in any kind of reform. But they did not explicitly state whether there is a link between poverty, economic growth and

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human development. The human development approach of human development report (HDR) does not link demographic factor like total fertility rate as the causal factor explaining the level of poverty. HDR is mainly concerned with three components of human development which are too few to comprehend human development. Sagar and Najam (1999, p:743) commenting on UNDP's concept on human development argued that basic concept of human development seems to have become stagnant and that the report must further explore the relationship between widening of human choices and the framework within which these choices are exercised.

The present study through its integrated approach based on factor analysis identified the determinants of as well as underlying dimensions of poverty in order of priority. The poverty assessment analysis so far provide only partial answer to this difficult question. The findings of the present study clearly shows that the basic needs dimension is the most important dimension of poverty in developing countries and therefore the most important task of the government in developing countries is to ensure that basic needs are provided which will increase the life expectancy (which is the most important factor in the present study) of the poor which in turn will lengthen the time horizon of the poor and strengthen their ability to fight against poverty. The results of the study also clearly emphasizes on the importance of small family size as a part of poverty reduction strategy. Secondly, after providing basic needs the government should allocate more resources towards increasing educational opportunities to increase the productivity of workers which will increase their

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capability to compete in the job market. Reports by Ranjit Dev Raj (1999) shows that South Asia is spending approximately 10 billion dollars a year on arm imports and Pakistan and India are increasing military budgets at a time when education is in urgent need of additional resources. High military expenditures continue to constrain the ability of some South Asian governments to address the needs of the poor and therefore reducing such expenditure should be a top priority of international and domestic players in South Asia. Bangladesh has also been criticized for failing to carry out financial and banking reform and for defense spending (Bangladesh has spent $100 m buying Russian jet fighter) and for under-funding education and public health (Chazan, 1999). Thirdly, government should also ensure adequate supply of food to keep pace with the growing population. Government should also increase its expenditure on health sectors (primary health care) which will indirectly help ensure adequate availability of physicians per population.

Actually, a comprehensive human development strategy would seek to exploit fully the positive linkages among different components of human development. This is because different components of human development are inter-connected and often their benefits spill-over each other in a positive manner. As people expect to live long and healthier, they have more incentive to invest in education and other productivity activities. This would raise income and break the poverty cycle. Improvements in human capital of the poor majority, notably in health and education, historically have been associated with declining

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fertility for a number of reasons: women gain greater access to employment opportunities outside home; lower infant and child mortality mean fewer births needed to attain a given probability of survival to adulthood; the importance of children's labour in family income diminishes; access to birth control and supporting health services improves and so on; (Cassen 1976; Caldwell 1982: cited in UNEP, 1995). Taking example from Korean success, the study emphasizes on the strong relationship between outward-looking development strategy, high quality education and improved health and nutrition (resulting in long school days and reduced loss of working days) leading to higher income growth needed for poverty reduction.

Policies designed to reduce poverty would have to take into account as many as possible the interrelationships among the various components of human development and between human development and poverty reduction. In addition, there is also a need to clearly define the roles of government and the private sector in financing and making investments in human capital (Psacharopoulos and Nguyen, 1997, p: 52).

To conclude, it is important to know whether policies that alleviate poverty in the short-term do so at the expense of long-term alleviation or whether they make it easier to achieve long-term success. Sustained economic growth is crucial to reducing poverty in the long-run. Among the decisive factors will be the rate at which resources such as physical and human capital accumulate and technical progress occurs in relation to the growth of population and labour force. As the study shows, while economic growth is not

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sufficient to ensure human development, sustained growth is likely to be central in the long run to policies intended to expand the capabilities of all people in the third world because all three components of human development, i.e., education, nutrition and health are greatly influenced by increase in per capita income.

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Table 4.1: Estimates of Regression Parameters for Equation One (N=74)
Model 1: Dependent variable: LNGER

Variable	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	4.2756	1.1486	3.72	0.0004*
LNPCY	0.2068	0.0320	6.46	0.0001*
LNLFPR	-0.5147	0.2660	-1.93	0.0572**
LNPEEDU	0.1238	0.0726	1.83	0.0715***

R^2 = .56 Adjusted R^2 =.54

Table 4.2: Estimates of Regression Parameters for Equation Two (N=74)
Model 2: Dependent Variable: LNLE

Variable	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	3.4895	0.0845	41.27	0.0001*
LNPCY	0.0396	0.0167	2.37	0.0208**
LNPPP	0.0756	0.0130	5.77	0.0001*
LNSAN	0.0170	0.0201	0.85	0.3988
LNPEH	0.0158	0.0245	0.65	0.5191

R^2 = .70 Adjusted R^2 =.68

Table 4.3: Estimates of Regression Parameters for Equation Three (N=74)
Model 3: Dependent Variable: LNDCS

Variable	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	6.3367	0.4708	13.39	0.0001*
LNPCY	0.0750	0.0154	4.86	0.0001*
LNTFR	-0.1209	0.0525	-2.30	0.0243**
LNFD1	0.2324	0.0978	2.38	0.0203**

R^2 =.58 Adjusted R^2 =.56

*p<.01, **p<.05, ***p<.10

LNGER=log of gross enrollment ratio at all levels, LNPCY=log of per capita income, LNLFPR=log of labour participation rate, LNPEEDU=log of public expenditure on education, LNLE=log of life expectancy, LNPPP=log of physician per population, LNSAN=log of sanitation, LNPEH=log of public expenditure on health, LNDCS=log of daily calories supply per capita, LNTFR=log of total fertility rate, LNFD1=log of food production

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Table 4.4:Estimates of Regression Parameters for Equation One (including dummies), N=74

Model 1: LNGER:dependent variable

Variable	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	3.3577	1.1314	2.96	0.0042*
LNPCY	0.1729	0.0335	5.19	0.0001*
LNLFPR	-0.2158	0.2709	-0.79	0.4528
LNPEEDU	0.2608	0.0840	3.10	0.0028*
D1	0.0020	0.1012	0.20	0.9839
D2	-0.2533	0.0913	-2.7	0.0073*

R^2 =.62 D1=Latin America, D2=Africa
Adj R^2 =.59

Table 4.5:Estimates of Regression Parameters for Equation Two(including dummies), N=74

Model 2: LNLE=dependent variable

Variables	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	3.6097	0.0821	43.93	0.0001*
LNPCY	0.0572	0.0160	3.57	0.0007*
LNPPP	0.0422	0.0144	2.92	0.0049*
LNSAN	0.0016	0.0186	0.09	0.9302
LNPEH	0.0195	0.0231	0.84	0.4029
D1	-0.0163	0.0369	-0.44	0.6598
D2	-0.1271	0.0345	-3.69	0.0005*

R^2 =.78 D1=Latin America, D2=Africa
Adj R^2 =.76

Table 4.6:Estimation of Regression Parameters for Equation Three (including dummies), N=74

Model 3: LNDCS=dependent variable

Variables	Parameter Estimate	Standard Error	t-value	Prob>T
Intercept	6.3271	0.4743	13.34	0.0001*
LNPCY	0.0793	0.0155	5.11	0.0001*
LNTFR	-0.1622	0.0600	-2.70	0.0088*
LNFD1	0.2436	0.0988	2.46	0.0163**
D1	-.00613	0.0426	-1.44	0.1547
D2	-0.0092	0.0393	-0.23	0.8165

R^2 =.60 D1=Latin America, D2=Africa
Adj R^2 =.57

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Table 4.7: The Loadings of Factor Analysis of the Rated Importance of 11 Variables in Explaining Poverty: Principal Component Method (PCM), Varimax and Promax Rotations (for 74 selected developing countries)

Factors	Unrotated factors (PCM)			Varimax Rotated Factors			Promax Rotated Factors		
	f_1	f_2	f_3	f_1	f_2	f_3	f_1	f_2	f_3
Daily calorie supply	**.79**	-.20	-.20	**.74**	.23	-.36	**.70**	-.13	.30
Total fertility rate	**-.80**	-.04	-.14	**-.80**	-.15	.02	**-.82**	-.03	-.07
Life expectancy	**.91**	-.07	-.01	**.87**	.25	-.12	**.85**	.12	-.07
Gross enrolment ratio	**.79**	.28	-.18	**.64**	.58	-.01	**.57**	.50	-.01
Per capita GNP	**.68**	-.35	.09	**.74**	-.09	-.19	**.76**	-.20	-.14
Sanitation	**.70**	-.13	.28	**.70**	.16	-.25	**.73**	.05	.29
Public expenditure on education	.13	-.80	-.28	-.12	**.81**	-.28	-.22	**.85**	-.24
Public expenditure on health	.35	.34	.58	.40	-.03	**-.64**	.50	-.05	**-.67**
Physician per population	**.79**	.10	.27	**.83**	.02	-.09	**.88**	-.11	.15
Labour participation	**-.58**	.36	.49	-.34	**-.74**	-.19	-.21	**-.72**	.20
Food production	.31	**-.55**	-.44	.29	-.05	**.72**	.22	-.08	**.71**

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ANNEX 1: LIST OF 74 COUNTRIES SELECTED FOR THE STUDY

ASIAN (16): Sri Lanka, India, Pakistan, Bangladesh, Indonesia, Malaysia, Philippines, Vietnam, Nepal, Jordan, Mongolia, Yemen, Lao PDR, Lebanon, Saudi Arabia, UAE

AFRICAN (39): Benin, Botswana, Burkina Faso, Burundi, Cameroon, Kenya, Sierra Leone, Niger, Nigeria, Malawi, Mali, Ghana, Lesotho, Gabon, Congo, Chad, South Africa, Gambia, Guniea Bissau, Tanzania, Mozambique, Zambia, Comoros. Mauritius, Mauritania, Madagascar, Swaziland, Namibia, Tunisia, Angola, Central African Republic, Senegal, Ethiopia, Uganda, Algeria, Morocco, Egypt, Zimbabwe, Togo

LATIN AMERICAN AND CARRIBEAN (19): Argentina, Bolivia, Brazil, Chile, Colombia, Jamaica, Dominican Republic, El Salvador, Guatemala, Nicaragua, Paraguay, Uruguay, Peru, Trinidad and Tobago, Ecuador, Honduras, Panama, Mexico, Costa Rica

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Chapter Five

LINKAGE BETWEEN POVERTY, HUMAN RESOURCE DEVELOPMENT AND ECONOMIC GROWTH: AN INTEGRATED MODEL FOR BANGLADESH

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5.1. Introduction

Bangladesh is a South Asian country, virtually surrounded by India. Its south-eastern trip borders Mynmar whilst the southern border is formed by Bay of Bengal. In 1998, its population was estimated at 124.8 million. The population of Bangladesh ranks among the poorest in the world, with an estimated GDP of some 348 per capita in 1998. Bangladesh ranks No. 146 on UNDP's Human Development Index list (UNDP, 2000). Bangladesh's human development level therefore reflects its level of economic development. Among all the developing nations, Bangladesh probably has the highest number of people in absolute poverty. Actually, the problem of poverty is more acute in Bangladesh than in any country of S. Asian region. In fact, the problem in Bangladesh seems to be much more intractable. In 1963/64, some 40.2 percent of the then East Pakistan rural population was considered poor, while 5.2 percent was extremely poor. The former figure was adjusted to 52 percent in a FAO study in 1977, which calculated that the incidence of poverty had by then increased to 61.1 percent of population. A subsequent study by the World Bank in 1987 suggested a decrease in the incidence of poverty between 1973/74 and 1981/82, but an increase in that of extreme poverty in the same period. Data sets for the period 1982-86 seem to be unreliable. The general contention however is that the incidence of poverty increased between 1982 and 1984, followed by a period of good harvests and a general improvements in living conditions in the period between 1984 and 1986 (Netherlands Ministry of Foreign Affairs, 1998, p: 27-28).

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For the period 1987-89, it is reported that the incidence of poverty did not change (around 57 percent), but many of the moderately poor crossed the line to extreme poverty. Hence it can be said that overall poverty situation deteriorated in this period.

The subsequent period, 1989-94, showed improvements in both measure of poverty. The proportion of poor declined from 57 percent to 23.1 percent. Looking at the absolute numbers involved, these improved proportions still represent an immense social problem in Bangladesh. In 1994, according to conservative estimates, Bangladesh was inhabited by some 115 million people, 55 million of whom were poor and of those 26 million were extremely poor. When the figures are analyzed by gender, women are consistently worse off than their men. The positive developments of 1990-95 period are reflected in the perceptions of the poor. In 1990, 50 percent of respondents considered themselves poor. While in 1995, this percentage had declined to 32.2 .Similarly, 24 percent considered themselves to be extremely poor in 1990, compared with 18 percent in 1995.

According to the World Bank Poverty Report (World Bank, 1998a), Bangladesh has made strong progress in reducing poverty following a period of stagnating poverty reduction in 1980s. As the report shows, the incidence of very poor fell from 43 percent of the population in 1991-92, to 36 percent in 1995-96; the incidence of poor declined from 59 percent to 53 percent during the same period. Although poverty has declined in both rural and urban areas, rural poverty is still higher than urban poverty. Reducing the

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poverty of the very poor in rural areas--- still at 40 percent of the rural population in 1995-96—remains a massive challenge.

The report also showed that although higher growth contributed to the decline in poverty, rising inequality has reduced the overall rate of poverty reduction in Bangladesh. But this does not mean that growth should not be pursued, rather the effect of growth on poverty reduction is positive. What is implied is that growth alone is not sufficient to reduce poverty. The gains from education, health, nutrition, other household and regional characteristics suggest other areas for policy emphasis because there is strong correlation between GDP per capita and indicators of human development. This once again establishes the fact the both economic growth and human development are essential for poverty reduction in Bangladesh. The next section discusses trends in both income poverty and human poverty in Bangladesh.

5.2. Trends in Income-Poverty

Since independence income poverty has fallen considerably in Bangladesh. The percentage of rural people below poverty line declined from 71 percent in 1973/74 to 51 percent in 1995/96 (Hossain and Sen, 1992; Sen 1998, cited in Sen, 2000). The rate of decline was remarkably fast in urban areas, where the incidence declined from a level of 63 percent to 26 percent during the same period. At the national level, this shows a reduction from 70.6 percent to 46.5 percent giving a long term poverty reduction rate of 1.55 percent per

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annum. While this rate is much lower than the historically observed areas in the high-performing Asian economies of East and South-East Asia, it was a commendable achievement, after decades of slow economic growth (Sen, 2000).

However, there are differences in opinion regarding the extent of poverty reduction that has taken place during the entire period of post-independence. Available evidence suggests that the rate of rural poverty was higher during the period between 1973-81 compared with the subsequent period of 1983-95 (11 vs. 0.4 percent per year). The matched difference between the two periods is negligible (2.97 as against 2.93 percent). Therefore, the incidence of national poverty declined at a faster rate in the first period than in the second period (1.29 percent vs. 0.92 percent) (Sen, 2000).

As Sen (2000) observes, available evidence suggests that there was marked instability in poverty reduction beginning with 1983/84. Rural poverty marginally declined between 1983/84 and 1988/89, slightly worsened between 1988/89 and 1991/92 and slowly improved thereafter. The overall gain over the entire 12 year period appears extremely modest. Thus the head-count index of poverty declined at a rate of 0.4 percent per year during 1983-95 . However, the poverty reduction performance improved during the nineties with rural poverty being reduced in the order of 0.9 percent per annum during the first half of nineties. This may be compared with the marked progress of 0.2 percent per year recorded during immediately preceding period of 1983-91. The corresponding difference between the two sub-periods is more pronounced in case of urban poverty

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reduction. Thus the rate of reduction in the urban poverty incidence was 2.2 percent per annum during 1983-91; it rose to 5.4 percent per annum during 1991-95 (Sen, 2000). In summing up the trends in poverty in Bangladesh over the last two decades, two basic points needs to be highlighted. First, the overall progress during the period between 1983/84 and 1995/96 was quite modest. Second, progress in income-poverty was considerably slower in rural areas than in urban areas. Thus the slow progress in rural poverty remains a key challenge facing the country in the coming decade (Sen, 2000).

5.3. Trends in Human Poverty

The value of HDI has roughly doubled in three decades, from 0.166 in 1960 to 0.309 in 1992, showing an annual average rate of increase in the order of 2.7 percent per year. The progress has been faster in the nineties: between 1992 and 1996/97, the HDI value has increased by 40 percent, with an implied average increase of 9.3 percent per year. It is to be noted that both over longer-term as well as over the recent period the pace of human development was faster than the rate of economic growth (Sen, 2000)

Human poverty focuses on three aspects of human deprivation: deprivation in longevity, deprivation in knowledge and deprivation in economic provisioning. The results show that the incidence of human poverty has declined from 61.3 percent in 1981-83 to 47.2 percent in 1993-94 and dropped further to 40.1 percent in 1995-97. At the same time the

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incidence of income-poverty at the national level declined from 52.3 percent in 1983/84 to 46.6 percent in 1995/96 (Sen, 2000).

Two aspects of this decline in poverty can be described in the sense that the progress on reducing human poverty was faster than the matched progress recorded in case of income poverty and that the progress in reducing human poverty was faster in the nineties than in the preceding decade (Sen, 2000). This implies that the average rate of decline in HPI was about 3 percent per year during 1981-97. The matched figure for income poverty reduction at national level was only 1 percent over 1983-95.

In Bangladesh both absolute and relative poverty assumes enormous dimensions. According to World Bank statistics, 83% of Bangladesh's 113 million people (1992) live in rural areas. According to studies undertaken by the Bangladesh Institute of Development Studies (BIDS), approximately 46% of the rural population do not have sufficient income and household production for a daily intake of 2122 calories (WHO's poverty line). The national average calorie intake is below this. Even though the problems are recognised and discussed, there has not been any significant change in the poverty situation, neither qualitatively nor quantitatively. According to BIDS, there is possibly a moderate improvement in the conditions for the upper segment of those under the poverty line, but there is absolutely no noticeable improvement in the extreme poor group. The Government's ability to convert their stated positive approach to concrete interventions and activities has been less than satisfactory, both for initiatives funded from the Government's own resources and for donor-financed initiatives. It has been extremely difficult to carry out activities which directly benefit the poorest section of

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the population. In this regard, a number of NGOs have had more success in carrying out such activities (Ministry of Finance, 1999b).

Studies show that although, a number of substantial government programs perform a 'safety net' function for the poor, it is clear that successive governments have not succeeded in any fundamental restructuring of society which could tackle the roots of poverty. A major reason for this basic failure of government programs to deliver their intended improvements to the life style of the poor is the close inter-linkage between the rural elite and Government. The elite have almost exclusive access to land, education and wealth which enable them to control the local political system through relatives, contacts and or corruption. Government has little capacity to actually implement improvements for the rural poor, since it largely lacks the will and the means to disempower the rural elites (Netherlands Ministry of Finance, 1999).

5.4. The Structure of Poverty in Bangladesh

In Bangladesh, despite efforts to alleviate poverty, half of its population of nearly 120 million entered the 1990s living below the poverty line. The pervasive poverty in rural Bangladesh is basically a result of combination of low labour productivity, concentration of assets such as arable land, and an enormous and fast growing labour force. A fundamental aspect of rural poverty is unemployment and underemployment.

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Several studies have been done on the estimation of poverty, trends and determinants of poverty in Bangladesh, but still today widespread and acute poverty remains the single most important problem facing Bangladesh. According to the study of Rahman (1995), income is an indirect measure of poverty. A direct measure of poverty is the level of malnutrition within a community. Ultimately, the very minimum objective of all development efforts is to assure the physical well-being of the population. A direct measure of poverty relates to the quality of living environment in which households and individuals pass their daily existence. The most significant indicators here are the quality of housing, access to safe water and sanitation. Data suggest that these indicators which make up the non-food environment are important variables influencing income of both poor and non-poor households.

The study by Hossain and Sen (1995) indicates that education is more effective in raising income when it is combined with access to land and capital and thereby income has profound impact on poverty. Access to electricity is found to have positive effect on income even after disassociating the effect of other variables. Poor households in villages having access to electricity earn 14 percent higher income than their counterparts in villages lacking this access. The number of workers is found to be a significant determinant of both group of households, poor and non-poor. Involvement in non-agricultural occupation increases household income through raising the productivity of labour. The returns from workers engaged in non-agricultural activities is about 13 percent higher compared to an average worker of poor households. The corresponding

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figure is 29 percent for the non-poor. The higher positive effect of occupational mobility from agriculture to non-agriculture on rural incomes for non-poor households may be because they are better endowed with capital and quality manpower than the poor. The findings by Hossain and Sen (1995) suggest the significant role of the development of non-farm activities in the alleviation of poverty.

The recent study by World Bank (1998b) in an attempt to determine the micro-economic determinants of poverty showed that education is the key determinant of urban living standards and to a lesser extent also of rural living standards. And that land ownership is the key determinant of rural living standards. The study also showed that differences in poverty between regions depend more on area characteristics than on differences in the characteristics of households living in those areas.

But it should be noted that all of the studies identified factors responsible for poverty in Bangladesh in aggregated sense and neither of the studies identified the determinants of poverty in order of priority. According to the report of strategy for Danish-Bangladeshi Development Corporation (Ministry of Foreign Affairs, 1999a), traditional anti-poverty theories focus on employment, credit and education projects as some of the significant parameters for alleviating poverty. The report argues that since employment programs seldom bring about lasting improvements in Bangladesh, they should be integrated into the sector programmes that aim at increasing agricultural and fish production and improved marketing. According to the report, although credit programmes have proven to be one of

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the effective means of encouraging production by the poorest groups in Bangladesh, the availability of credit is only a part of the program in the production process and should therefore be included as an integrated part of the sector program.

The World Bank poverty assessments reports in Bangladesh (World Bank, 1998b) suggest five pillars for a poverty reduction strategy : (1) accelerating economic growth;(2) promoting education for the poor; particularly primary education and particularly for girls (3) investing in poor areas to take advantage of strong location effects on poverty reduction;(4) improved targeting of public expenditures and safety nets to reach the poor better and (5) forming further partnership with NGOs to reach the poorest and not so poor in ways designed to make a stronger attack on poverty. The report also adds that apart from broad-based growth, targeted investments in the human and physical capital of the poor can reduce poverty and limit inequality It shows that education and landownership are key determinants of living standards. This finding suggests that occupation is also important determinant affecting poverty. And concludes that investment policies aimed at poor will reduce poverty and that developing the rural non-farm sector hold considerable potential for poverty reduction. But the report fails to identify the determinants of poverty in order of priority.

Although poverty is the overarching goal of the govt. of Bangladesh, Bangladesh has never had a homegrown approach to combat poverty nor had a clearly articulated operational approach to address the issue. Rather agendas for poverty alleviation had

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remained largely donor driven. As a result what has served as a strategy for poverty alleviation in Bangladesh has been like more than aggregation of a large number of various donor-funded micro-projects supplemented by some discrete domestically funded programmes (CPD, 2000)

The present study ... emphasizing on the integrated approach towards poverty alleviation identifies determinants of poverty in order of priority as well as explores the possible linkage between poverty, human development (HD) and economic growth (EG).

5.5. Data, Variables and Methodology

In analyzing the link between poverty, economic growth and human development in Bangladesh, the analysis used FACTOR ANALYSIS as used in the case of developing countries. The variables included here are daily calorie supply per capita, total fertility rate, per capita income, life expectancy, sanitation (% distribution of households by type of toilet, kuncha and open field), literacy rate, percentage distribution of households by landownership (proportion of landless population), percentage distribution of population without electricity, percentage distribution of population by type of works (agriculture and non-government employee) and distribution of monthly expenditure on major food items per household (in Taka). Data have been taken from the Report on Analysis of Basic Needs Dimension of Poverty, Vol. 3, 1998 prepared by BBS. Data on TFR have been

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taken from Progotir Pothey published by UNICEF, 1997. Because of unavailability of data on such important variable as transport in the context of Bangladesh, it was not possible to include this variable in the present study.

Like the case of developing countries, to analyse the linkage between poverty, human development and economic growth in case of Bangladesh, this section was originally consisted of two parts based on three components of human development: education, health and nutrition. In the first part, three equations were formed based on three components of human development: education was measured by literacy rate, health was measured by life expectancy and nutrition was measured by daily calorie supply per capita. The three equations to be estimated were as follows:

LNLIT=f (LNPCY, LNELEC, LNAGR, LNEMPL)---------- (1)

LNLE=f (LNPCY, LNSAN, LNFFD)----------(2)

LNDCS=f (LNPCY, LNTFR, LNFFD)----------(3)

where LNLIT= log of literacy rate, LNPCY=log of per capita income, LNELEC=log of percentage distribution of population without electricity, LNAGR= log of percentage distribution of population involved in agriculture, LNEMPL= log of percentage distribution of population engaged as non-government employee, LNLE= log of life expectancy, LNSAN= log of sanitation, LNFFD=log of distribution of monthly expenditure on major food items per households (in Taka), LNDCS=log of daily calorie supply per capita and LNTFR=log of total fertility rate. It should be noted here that the variable landownership has not been included in this part because it might overlap with the variable per capita income

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Each of these equations were estimated by multiple regression. But because of very low value of R^2 in all three cases, the results of multiple regression were discarded. In the second part, all the variables of the three equations including the variable landownership, were incorporated in a single model which is then estimated by Factor Analysis. This integration of three components in a single model can be termed as an integrated approach to analyse the linkage between poverty, economic growth and human development.

It should be noted that like all other multivariate analyses, technique of factor analysis is a study of mutual association rather than a study of causality. The decomposition of the original set of variables into smaller subset of factors partitions the totality of variables into essentially independent subgroups.In this sense, the analysis can be used to infer the extent of interdependence of a given set of forces within a single factor (Adelman and Morris, 1967).

5.6. Result and Interpretation of Findings

The result of factor analysis (FA) has been summarized in Table 5.1, 5.2 and 5.3. In the present case, FA identified three factors explaining about 70 percent of the variations in the original data and the analysis was based on the results of varimax rotations. It should be noted here that the selected variables in the present case compared to other variables tried explain the largest variation in the original data. The first factor explained about 44

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percent of the variation in explaining the level of poverty, additional 14 percent is explained by second factor and another 12 by the third factor.

First Factor

The characteristics having their highest loading in factor 1 are per capita income, landownership, electricity, literacy rate, agricultural employment and non-agricultural employment and sanitation. This factor explaining about 44 percent of the variation can be interpreted as **economic and social dimension** associated with the level of poverty. The most important variable identified in this factor is the non-government employment of poor followed by agricultural employment and electricity. Sanitation is also appeared as an important factor. The other variables identified are literacy rate, per capita income and landownership. The findings of the study shows that generation of non-agricultural employment opportunities will have profound effect on poverty because of increased pressure on agricultural sectors. Poverty in Bangladesh depends critically on conditions in the rural areas where most people live. The lack of progress here can be seen from the continuing high proportion of population working in agriculture--- generally with low productivity and income. Studies show that the devastation occurs primarily in countries whose economies depend on agriculture, but lack the means to make their farmland productive. The poorly functioning agriculture sector in Bangladesh adversely affects poverty (Carter, 1999). This finding also shows that enhancing the quality of labour force

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through education can raise the productivity levels and consequently wage levels. In view of encouraging non-farm activities in rural areas, rural infrastructures like rural electrification and sanitary facilities need to be developed.

Sanitation is considered as one of the components of basic human needs, because it has significant implication not only for proper living condition but also for health of the people. Poor sanitation systems always cause health hazard. Studies show that only 12.9% of the households in Bangladesh use sanitary latrine. A large segment of the households use pit and kuntcha latrine. It is very disappointing that still, now 24.1% households have no fixed latrine but use open field/bush for natural call (BBS, 1995). Poor sanitation increases the risk of diseases such as cholera and diarrhea when bacteria, viruses and parasites contaminate drinking water. According to WHO, the trend toward more "sanitation have-nots" is accelerating in developing countries (Anonymous, 1998a). Studies show that many environmental health problems are associated with poverty and lack of clean water, food shelter, fuel and air. Inadequate access to clean water and sanitation and inadequate garbage collection and disposal causes millions of infectious diseases and deaths in developing countries each year----mostly in Africa and Asia (Knight, 1998).

Actually, the development of social infrastructure like rural electrification and improvement of environmental factors like proper sanitary facilities can expect to contribute to better social opportunities. Generally poverty generates from inadequate

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income. The generation of non-agricultural employment is expected to increase per capita income which is essential to live a decent living to satisfy the basic needs. Employment is fundamental to human development strategy and it is necessary to reap the full benefits of investment in human capital. The returns to human development expenditure will fall dramatically if those who embody human capital are unable to put their energy, skills, knowledge and initiative to productive use. Employment provides people with a source of income. A recent study shows that it is principally chronic poverty that pushes people into sickness. Low income may affect health directly through inadequate housing and sanitation or indirectly threatening, socially disrupted neighbourhoods and the promotion of behavior and psychological characteristics that are deleterious to health (Anonymous, 1998b).

Landownership has been appeared with lowest loading in this factor. Studies show that although land remains the dominant source of income and economic security, it does not substantially improve human development parameters with relative levels of income. In view of marginal land being brought under cultivation, further increase in land is not a feasible option and hence the average size of farm per farm worker cannot be increased. However, through promoting multiple cropping and cropping intensity, gross cropped area per farm worker can be raised. Thus in agricultural sector, further employment generation is possible through increasing yield rates, promoting cropping practices and increasing cropping intensity.

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Second Factor

Daily calorie supply per capita and distribution of monthly expenditure on major food item per household has been identified as a second factor explaining the level of poverty. These together can be described as **nutritional dimension** of poverty. Poverty refers to a state of deprivation from availing goods and community services which are essential for normal living. Absolute poverty is measured in terms of requirement for minimum standard of living in terms of calorie intake and nutritional levels. It indicates nutritional dimensions of poverty. Nutrition is an important yardstick to measure poverty situation.

But poverty situation can also be judged by share of income or expenditure spent on food. When high percentage of income is spent on consumption of food, then, little share is left for meeting other basic needs such as clothing, housing, health and education etc. Such situation obviously indicate prevalence of poverty. In Bangladesh, about 80% of the calorie need of the people of Bangladesh is supplied by the cereals. This indicates that Bangladeshi people consume food grain in large quantity than the other food items.

Poverty situation can also be judged by share of income or expenditure spent on food. Available data shows that 57% income or 64.8% expenditure are spent on consumption of food. This high percentage of income or expenditure for food consumption indicates that other basic needs are not properly fulfilled (BBS, 1995, p: 23). The study by BBS shows that in Bangladesh monthly per household expenditure by social group is Taka 3609, whereas, monthly per household expenditure on education is Taka 131 which is only 3.63% , a very insignificant share of total household expenditure.

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What is important is that "investment in nutrition aimed at vulnerable groups can lessen and in some cases, eliminate the debilitating and potentially fatal effects of malnutrition. Simultaneously, the same investment can begin to address the underlying causes of poverty and malnutrition by allowing the poor and malnourished to be more productive and to benefit more from education, both important stimulus of economic growth" (Psacharopoulos and Nguyen, 1997, p: 44).

Third factor

Factor three identified such variables as life expectancy and total fertility rate explaining about 12 percent of the variations in poverty level. These together can be interpreted as **health dimension** associated with the level of poverty. Life expectancy is one of the most important indicators of health. Life expectancy of the population is an important factor both in determining the incentives to invest in various forms of human capital and the value of the stock of such capital. Despite the emphasis that has been put on the adverse effects it has in causing population growth, there is no other quality attribute that is as important and pervasive as improved health in its contributions to the welfare of people in low-income countries (Schultz, 1980, p: 34). The favourable economic implications of these increases in life span are pervasive. Longer life spans provide additional incentives to acquire more education as investments in future earnings. Parents invest more in their children The additional health capital and the other forms of human capital tend to increase the productivity of workers. Longer life results in more years to participate in the

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labor force, and brings a reduction in sick time. Better health and vitality in turn lead to a more productivity per man-hour at work (Schultz, 1980, p:14). This has serious implications for developing countries where the fertility rate is very high. Decline in fertility level depends in many cases on the decline of mortality rates which results from improvements in life expectancy. Empirical analysis supported the implication that birth rates are lower in the modern world with growing human capital than they are in traditional agricultural Malthusian –type economies.

Several studies show that children from smaller families generally tend to be more intelligent, more ambitious and more independent and to possess higher self-esteem than those from large families. Children from smaller families also tend to have better health and higher survival probabilities (King, 1987, cited in Oberai, 1993, p: 151) . While Bangladesh has made remarkable strides in improving health and welfare of its population, significant challenges still lie ahead. At its current rate of growth, Bangladesh population could double again in 35 years. The country continues to have one of the highest rates of malnutrition in South Asia. In 1992, two-thirds of children under six suffered moderate to severe malnutrition.

5.7. Conclusion

As the findings of the study shows poverty in Bangladesh is multidimensional being caused by a wide range of factors. Morcol (1997) first explained external and internal

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causes of poverty in Turkey by way of Factor Analysis using the framework given by Feagin (1972). He identified three conceptual categories: structural, fatalistics and individualistics. The structural factors are social and economic forces such as lack of education and low wages. Fatalistics explanations relate to illness and bad luck while individualistic explanations relate to lack of thrift and effort, loose morals and drunkenness. The present study examined conceptual dimensions of poverty in Bangladesh in order of priority. The structural causes are most important in Bangladesh than fatalistic and individualistics. The study clearly shows that social and economic forces are the most important in explaining poverty in Bangladesh. The study also shows that poverty is the result of nutritional deficiency and lack of proper health care.

Among the economic and social forces, the most important are employment of rural poor in non-government organisation followed by employment in agriculture, electricity, and sanitation. Among the economic and social forces the other factors are per capita income, literacy rate and landownership. It is to be mentioned here that the variables representing proportion of population engaged in non-government organisation as well as proportion of people engaged in agriculture also played a key role in ranking the 64 districts of Bangladesh according to the index of poverty.

Thus the present study has placed strong priority in promoting employment opportunities in non-government organizations as well as in agricultural sector. Studies show that it is direct and indirect effects of agricultural growth that accounts for virtually all of the

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poverty decline. The marked slowing of poverty reduction in Asia during the past decade and increasing poverty in Africa are both the result of neglect of agriculture by governments and foreign aid institutions (Mellor, 1999). Agriculture dominates Bangladesh's economy and determines the income and consumption levels of the vast majority of the poor. Agriculture is likely to remain a large part of Bangladesh's economy well into the next century. With the vast majority of its people living in rural areas and more than half of them living below poverty line, no growth and poverty alleviation strategy can succeed without a healthy agricultural sector.

However, an important pre-requisite for this is an improvement in economic infrastructure like electricity and adequate sanitation. Rural electrification reduces the cost of irrigation and facilitates the development of the rural non-farm sector. Studies show that extreme poor benefit more from generation of employment opportunities in the rural non-farm sector than from increasing the profitability per unit of land. Studies also show that for the functionally landless and the small farm households, poverty is substantially lower for villages with access to electricity. Hard core poverty improved substantially between 1987-88 and 1989-90 for villages with access to electricity. The provision of adequate sanitation also depend to a large extent by proper electrification in rural areas.

Many governments in developing countries have placed a higher priority on safe water but access to safe water only is not enough. Without a stronger commitment to sanitation,

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it will be difficult to reduce the incidence of diarrhoea, a leading child killer in Bangladesh and other diseases that flourish in unsanitary conditions. Studies show that while in Bangladesh, about 80% of people can count on safe water supplies, only 39 percent have adequate access to sanitation (BBS, 1995). In Bangladesh , it is irony that still today its citizens are diminished not by an implacable enemy or an incurable disease but by something as mundane and easily preventable disease as diarrhoea due to lack of safe water and adequate sanitation (Khan, 1999)..

The study also shows that lack of access to jobs and poverty are closely associated with lack of schooling above the primary level; it is mainly secondary level qualifications which facilitates access to more desirable employment opportunities. Educational attainment is positively related to individual performance in the labour market. Those with higher levels of education are more likely to participate in the labour market, face lower risks of unemployment and receive an average higher earning. It is well known that educational investment is essential to increase worker's ability to adapt changing job conditions in an environment of uncertain technological changes. Economic growth under modern conditions brings about vast changes in job opportunities. Schooling in this connection is valuable because it is a source of flexibility in making these occupational and spatial adjustments. In this regard, a rapid change of export, industry and employment structures can favorably influence demand for education (Lee, 1999).Thus the present study emphasizes on expanding education at all levels.

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Although land is one of the most important determinant of poverty in Bangladesh, studies shows that problem of land distribution cannot be solved by drastic land reform. Successive governments have promised agricultural land distribution but little has been achieved. Even state (khas) land has rarely been made available to poor (Netherlands Ministry of Foreign Affairs, 1998). In this situation, generation of employment in non-govt. organisation is critical in alleviating poverty in Bangladesh.

The present study also shows that as nutritional dimension is also important dimension of poverty. According to World Bank statistics, 83% of Bangladesh's 113 million people (1992) live in rural areas. According to studies undertaken by the BIDS, approximately 46% of the rural population do not have sufficient income and household production for a daily intake of 2122 calories (WHO's poverty line). The national average calorie intake is below this (Ministry of Foreign Affairs, 1999b).

Chronic malnutrition , even in countries where people get enough calories, is forcing researchers to take a closer look at the micro-nutrient content of the foods produced by agricultural systems. While some developing nations still fail to meet the basic caloric needs of their people, it is even more alarming that new research shows many developing and even developed countries are producing agronomically successful crops that fail to provide adequate nutrients to meet essential health and nutritional needs. Estimates are that 40 percent of the world's people do not receive adequate and balanced nutrients to meet their basic dietary requirements (Welch, 1999).

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Therefore there is an urgent need to increase the incomes of the poor to have proper access to other basic needs of life as health and education. This fact has been clearly visible in the first factor which emphasizes on the generation of employment opportunities in both non-government organizations as well as in agricultural sector.

The study finally shows that poverty is related to health dimension also explaining about 10 percent of poverty. Health dimension identified life expectancy and total fertility rate as the crucial determinant of poverty in Bangladesh.. In Bangladesh life expectancy is lower than that in most developing countries and Bangladesh is found to be one of the few countries where women lead shorter lives than men. This is evident if we look at high female and maternal death rate. According to World Bank Country Study, the main reasons for high maternal mortality are young age and frequent pregnancies as well as precarious state of nutrition- a life time of inadequate food intake results in insufficient growth and pelvic development for child bearing (Novartis, 1999) .Mizan (1994) also observes that food consumption habits in poor households generally results in malnutrition and excessive child bearing leads to health complications for rural women. Therefore there is an urgent need for fertility reduction which ultimately depends on socio-economic development of the country as the first factor indicates. Because where socio-economic conditions are poor, the health of the whole community is threatened.

In case of Bangladesh, since poverty is mostly, permanent and structural (chronic poverty) rather than transient as the first factor shows, the emphasis on investing in human capital

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(education, health and nutrition) along with provision of income generating employment is important for alleviation of poverty. Therefore, a clear understanding of the nature of poverty based on interrelationship among different components of human development and between human development and poverty reduction is usually crucial point for choosing a new program or revamping an existing one.

Human development precedes economic development as shown by the spectacular examples of East Asia. This is yet to happen in Bangladesh, which is caught in a trap of unemployment, low investment and poor productivity. The finding of the study also emphasized on prioritizing the determinants of poverty in the process of poverty alleviation, because too many objectives could undermine a sense of priorities

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Table 5.1: The Loadings for Factor Analysis of the Rated Importance of 11 Variables in Explaining Poverty: Principal Component Method (for Bangladesh)

Variables	Extracted Factors & their Loadings		
	Factor I	Factor II	Factor III
Daily Calorie Supply per capita (DCS)	.18	.32	**.78**
Per Capita Income (PCY)	**.76**	.29	.21
Proportion of landless (LAND)	**.48**	-.29	-.07
Distrbution of monthly expenditure (FFD) on major food items per household	**.69**	.42	.40
Percentage distribution of (ELEC) population without electricity	**.85**	.11	.13
Literacy rate (LIT2)	**.76**	-.07	-.14
Proportion of people working in (AGR) Agriculture	**-.86**	.02	.11
Proportion of people working (EMPL) as non-government employee	**.89**	-.09	-.15
Life expectancy (LE)	.09	**-.65**	.51
Total fertility rate (TFR)	-.01	**.80**	-.29
Sanitation (SAN)	**-.80**	.14	.17

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Table 5.2: The Loadings of Factor Analysis of the Rated Importance of 11 Variables in Explaining Poverty: Varimax Rotations (Orthogonal, for Bangladesh)

Rotated Factor Pattern

Variables	Factor I	Factor II	Factor III
DCS	.10	**.85**	-.12
PCY	**-.61**	.57	.13
LAND	**-.52**	-.04	-.22
FFD	-.46	**.76**	.15
ELEC	**.85**	-.12	.03
LIT2	**-.77**	.09	.00
AGR	**.85**	-.18	-.03
EMPL	**-.90**	.13	-.01
LE	-.04	.13	**-.83**
TFR	.06	.14	**.84**
SAN	**.82**	-.06	.03

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Table 5.3: The Loadings of Factor Analysis of the Rated Importance of 11 Variables in Explaining Poverty: Promax Rotation (Oblique, for Bangladesh)

Rotated Factor Pattern

Variables	Factor I	Factor II	Factor III
DCS	.28	**.92**	-.17
PCY	**-.51**	.50	.10
LAND	**-.56**	-.11	-.21
FFD	-.33	**.72**	.11
ELEC	**.87**	.00	.04
LIT2	**-.78**	-.02	.00
AGR	**.85**	-.05	-.02
EMPL	**-.91**	-.00	-.01
LE	-.04	.19	**-.84**
TFR	.11	.10	**.84**
SAN	**.85**	.06	.03

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Chapter Six

CONCLUSION

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6.1. Discussion and Conclusion

"Poverty is, in many ways, the worst form of human deprivation and can involve not only lack of necessities of material well being but also the denial of opportunities of living a tolerable life' (Anand and Sen, 1997, p: 4). Human development is the process of widening people's choice and the level of well being they achieve. Income is clearly one option that people would like to have, though an important one. But it is not the sum total of their live. Income is also a means but human development the end (UNDP, 1997). An essential feature of human development paradigm is productivity which requires an investment in people and an enabling macro-economic environment for them to achieve their maximum potential. Economic growth is therefore a subset of human development needs---an essential part but not the entire structure (Huq, 1995, p:9). This implies that neither economic growth nor human development alone is sufficient for poverty reduction.

The present study therefore gives emphasis on both economic growth and human development for poverty reduction. The main objective of the study is to explore the possible linkage between poverty, economic growth and human development through an integrated approach based on three components of human development: education, health and nutrition. In analyzing such linkage, the study consists of two parts. In the first part (chapter two), an index of poverty has been developed for 106 selected countries on the basis of their achievement in economic growth, human development and levels of poverty

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by employing Principal Component Analysis (PCA). For this purpose six variables have been chosen to calculate the index. These are life expectancy, gross enrollment ratio at all levels, access to sanitation (as % of GNP), access to safe drinking water, total fertility rate and GNP per capita ($PPP). The findings of the analysis show that these variables explains most of the variations (79%) in the original data as compared to other variables. The present study tried each and every variable representing economic growth and human development available in various published reports of UNDP and World Bank. The ranking of the countries based on their achievements in economic growth , human development and levels of poverty according to PCA are then compared with the rankings of these countries according to HDI. In this study, an attempt has also been made to calculate the index of poverty with the help of PCA using the same three components as used to calculate the HDI which are then compared with the rankings of countries based on HDI. Attempt has also been made to calculate the index using four as well as five variables by iteration to compare the results. The results show that the rankings of the countries based on the above six variables are more accurate than the rankings based on only three variables because these three variables are too few to comprehend human development while rankings based on the above six variables explains most of the variations in the original data and shows many aspects of human development. The analysis shows that although Canada and Sierra Leone capture the first position and last position respectively among the selected countries according to both the methods, there are wide variations in ranking among other countries concerned. By comparing the ranking of countries according to two methods, the study shows that PCA is a better

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measure of poverty than HDI because PCA determine with greater efficiency even the small changes attributable to other factors, in addition to the major component. The results also shows that human development factors are more important than economic factors in explaining the link between poverty, economic growth and human development because in the present case human development factors carried more weights than economic factors, such as GNP per capita in calculating the index. By contrast, the main weakness of HDI is the equal weight given to each three components without providing any justification for doing so. As mentioned earlier, the method of principal components provides an easy procedure for letting data determine the weights that capture largest fraction of the variance.

In the third chapter, an index of poverty has been developed for 64 districts of Bangladesh by applying the same method, PCA, which is then compared with HDI as calculated for 64 districts by UNDP (1996). Because of unavailability of the data it was not possible to consider the same variables as used in the case of 106 selected countries. The variables considered are life expectancy, literacy rate, per capita income, sanitation (percentage distribution of households by type of toilet, both kuncha and open field), electricity (percentage distribution of households without electricity) and employment (percentage distribution of population by type of works, both agriculture and non-government employee). As can be seen from above that the variable access to safe drinking water has not been considered here. The reason for this is that about 79 percent of population in Bangladesh has access to safe drinking water while only 39 percent of population has

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access to proper sanitation. Therefore access to proper sanitation is now-days considered to be a more important indicator than access to safe water in case of Bangladesh. The other important variables like access to electricity and type of employment have been included in the present case. And the results show that these variables explain most of the variations in the original data indicating close link between poverty, economic growth and human development. According to the findings, it can be said that there are wide variations in the rankings of the districts based on PCA and HDI. For example, although Dhaka captures the highest position according to both methods, Kurigram captures the lowest position according to PCA while Cox's Bazar captures the lowest position according to HDI. But data analysis show that Cox's Bazar has much higher PCY, higher life expectancy and literacy rate as well as higher percentage of people working as non-government employees compared to Kurigram. The second position was secured by Narayanganj according to PCA but it was placed in 17th position according to HDI. The limitations of calculating HDI has been mentioned in the third chapter in details but it should mentioned here that the present study considered more as well as different types of variables showing many aspects of human development compared to HDI. Recently, BIDS (1999) has ranked 64 districts of Bangladesh using the concept of HPI as proposed by Sen. According to HPI value, the most deprived districts are Bandarban and Jamalpur followed by Rangamati, Sherpur and Nilphamari. Dhaka and Munshiganj appear to be the most developed districts according to this index. By contrast, the results of PCA shows that although Dhaka captures the first position, Munshiganj captures the seventh position. And as mentioned above that Kurigram secured the lowest position

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according to PCA while Bandarban and Jamalpur capture 48th and 60th position respectively. The limitations in constructing HPI have been discussed in second chapter and it should be mentioned that the main limitation of HPI is that in calculating HPI, many important variables have been excluded and that variables considered cannot be reduced to dimensionally similar terms, that is the variables are on different population aggregates. For example, deprivation in terms of survival, in access to safe water, in access to health services relate to whole population while adult literacy refers to the population of adults. By contrast, all the variables considered in calculating the index according to PCA refer to whole population and therefore can be reduced to dimensionally similar terms.

In the fourth chapter, the linkage between poverty, economic growth and human development has been explained by separate models. In this section, the main objective was to identify the determinants of poverty in 74 selected developing countries as well as to explore the possible linkage between poverty, economic growth and human development based on three components of human development: education, health and nutrition. For this purpose, three equations were developed based on these three components which are then estimated by multiple regression. The components of these three equations were then integrated into a single model and was estimated by Factor Analysis. This approach is known as **Integrated Approach** to poverty analysis.
The results of multiple regression identified determinants of poverty based on three components of human development. The basic determinants identified are lack of income, lack of adequate expenditure on education, lack of adequate number of physician, high

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fertility rate and lack of adequate supply of food. Results of Factor Analysis identifies three factors exploring the link between poverty, human development and economic growth as well as indicates the possible dimensions of poverty in order of priority. The first actor labeled as **basic needs dimension** includes such factors as, per capita income, sanitation, gross enrollment ratio at all levels, total fertility rate, daily calorie supply per capita and physician per population clearly shows that there is a close link between poverty, economic growth and human development and that there is likely to be nexus of relationship between education, health, fertility, nutrition and income each assisting and reinforcing each other. Actually the first factor explaining the most of the variation (44%) in the level of poverty clearly shows the proposed links between poverty, economic growth and human development as it includes variables indicating economic growth , human development as well as demographic situation having close relationship with the level of poverty. The second factor comprising public expenditure on education and labour participation rate is labeled as **basic capability dimension** and the third factor comprising public expenditure on health and food production is labeled as **basic entitlement dimension.** The results of regression model more or less confirm the results of factor analysis. For example, in all three regression models, PCY has been appeared to have significant influence on three components of human development. Thus we see that PCY has been appeared in the first factor (in factor analysis) explaining most of the variations in the level of poverty. But public expenditure on health and sanitation have been appeared to have no significant influence on life expectancy in the second regression model. As we see, the variable, public expenditure on health has been appeared in the third

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factor (in order of priority) explaining only 10% of the variation in the level of poverty (in factor analysis). But only exception is sanitation which was insignificant in the regression model has been appeared in the first factor (in factor analysis) affecting the level of poverty, not life expectancy.

The fifth chapter based on factor analysis also uses the same approach to explore the possible linkage between poverty, economic growth and human development with special reference to Bangladesh. It should be mentioned here that in case of Bangladesh, since the value of R^2 in three regression models based on three components of human development appeared to be very low, the study uses only factor analysis incorporating all the variables of three components in a single model which is referred to as **integrated model for Bangladesh.** Due to unavailability of data it was not possible to consider the same variables as used in case of 74 developing countries. The variables included are daily calorie supply per capita, per capita income, proportion of landless, percentage of total expenditure on food, access to electricity, literacy, proportion of population engaged in agriculture, proportion employed as non-government employee, life expectancy, total fertility rate and access to sanitation. Due to unavailability of data it was not possible to include such important variables as public expenditure on education (as % of GNP) and public expenditure on health (as % of GNP). Instead, since in Bangladesh, access to land and unemployment are closely related to poverty, the variables like proportion of landless and percentage of population by type of works have been considered.

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The results in the present case explain about 70% of the variations in the original data and identifies three factors explaining the link between poverty, economic growth and human development as well as identifies the possible dimensions of poverty in order of priority. Actually the first factor labeled as economic and social dimension of poverty explain most of the variations (44%) in the level of poverty. The first factor includes such variables as per capita income, landownership, literacy rate, agricultural employment, non-government employment, electricity and sanitation. The second factor comprising daily calorie supply per capita and distribution of monthly expenditure on food is labeled as nutritional dimension of poverty while the third factor comprising life expectancy and total fertility rate is labeled as health dimension of poverty. It can be seen that as in case of developing countries, in case of Bangladesh also, the first factor includes most the variables representing economic growth and human development indicating the link between such factors and levels of poverty.

The most important dimension of poverty identified in case of Bangladesh is the social and economic dimension followed by nutritional dimension and health dimension of poverty. The analysis therefore shows that poverty in Bangladesh is more structural than transient. However, from the regression analysis and factor analysis the study concludes that both economic growth, human development as well as demographic factors are important in explaining level of poverty and that all should be jointly promoted in the process of poverty alleviation. The main difference of present analysis from previous analysis of poverty is that it identifies possible dimensions of poverty in order of priority in exploring

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the possible link between poverty, economic growth and human development. Policies designed to reduce poverty therefore should take into account as many as possible the interrelationships among various components of human development and between human development, economic growth and poverty reduction.

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APPENDIX I

DATA FOR 106 SELECTED COUNTRIES

Country	CC	SW	SAN	TFR	LE	PCY	GER	PPP	LIT	GER2	LE2
Angola	1	32	16	6.8	46	270	31	839	46.5	45	46.5
Argentina	2	64	89	2.7	73	8380	73	8498	96.5	79	72.9
Australia	3	95	90	1.8	78	20090	79	19632	99.0	100	78.2
Austria	4	100	100	1.4	77	28110	87	21322	99.0	86	77.0
Bangladesh	5	79	35	3.4	58	260	39	1382	38.9	35	58.1
Belarus	6	100	100	1.3	69	2070	80	4604	99.0	80	68.0
Belgium	7	100	100	1.5	77	26440	86	21548	99.0	100	77.2
Benin	8	50	20	5.9	55	350	35	1800	33.9	42	53.4
Bolivia	9	60	44	4.4	61	830	66	2617	83.6	70	61.4
Botswana	10	70	55	4.3	51	2800	71	5611	74.4	70	47.4
Brazil	11	72	41	2.4	67	4400	72	5928	84.0	80	66.8
Bulgaria	12	100	99	1.2	71	1190	66	4604	98.2	70	71.1
Burkina Faso	13	78	18	6.7	46	230	20	784	20.7	20	44.4
Burundi	14	59	51	6.4	47	170	31	637	44.6	23	42.4
Cambodia	15	13	14	4.6	53	300	58	1110	66.0	61	53.4
Cameroon	16	41	40	5.5	56	610	46	2355	71.7	43	54.7
Canada	17	100	85	1.7	79	19020	100	21916	99.0	99	79.0
Chad	18	24	21	5.6	48	160	25	1172	50.3	29	47.2
Chlie	19	86	83	2.3	75	4860	72	9930	95.2	77	74.9
China	20	90	21	1.9	70	750	58	2935	82.9	69	69.8
Columbia	21	76	63	2.7	70	2140	70	6347	90.9	71	70.4
Congo	22	47	9	6.0	51	670	56	2554	76.9	68	48.6
Cote^d Ivoire	23	72	54	5.1	54	660	39	1731	42.6	40	46.7
Croatia	24	96	68	1.6	72	3800	67	3972	97.7	67	72.6
Denmark	25	100	100	1.8	75	32100	89	21983	99.0	89	75.7
Dominican Republic	26	71	78	3.1	71	1600	68	6424	82.6	66	70.6

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DATA FOR 106 SELECTED COUNTRIES: CONTINUED

Country	CC	SW	SAN	TFR	LE	PCY	GER	PPP	LIT	GER2	LE2
Ecuador	27	70	64	3.1	70	1500	72	4602	90.7	73	69.5
Egypt	28	64	11	3.3	65	1080	69	3829	52.7	72	66.3
El Salvador	29	55	68	3.5	69	1700	55	2610	77.0	64	69.1
Ethiopia	30	27	10	7.0	49	100	18	455	35.4	24	43.3
Finland	31	100	100	1.8	77	23240	97	18547	99.0	99	76.8
France	32	100	96	1.7	78	26270	89	21176	99.0	92	78.1
Gabon	33	67	76	5.0	55	3950	60	3766	66.2	60	52.4
Gambia	34	76	37	5.3	53	330	34	948	33.1	41	47.0
Ghana	35	56	27	5.0	59	360	44	2032	66.4	42	60.0
Greece	36	100	96	1.4	78	11460	82	11636	96.6	79	78.1
Guatemala	37	60	66	4.6	66	1470	46	3682	66.6	47	64.0
Guniea	38	62	70	5.7	46	560	24	1139	37.9	28	46.5
Guniea Bissau	39	23	20	6.0	44	250	29	811	33.6	34	45.0
Haiti	40	28	24	4.3	55	310	29	917	45.8	24	53.7
Hondurus	41	65	62	4.5	67	660	60	1977	70.7	58	69.4
Hungary	42	100	94	1.5	70	4340	67	6793	99.0	74	70.9
India	43	81	29	3.1	63	380	56	1422	53.5	55	62.6
Indonesia	44	62	51	2.6	65	1080	62	3971	85.0	64	65.1
Ireland	45	100	100	1.9	76	17110	88	17590	99.0	88	76.3
Israel	46	99	70	2.6	77	15870	75	16699	95.4	80	77.8
Italy	47	100	100	1.2	78	19880	73	20174	98.3	82	78.2
Jamaica	48	70	74	2.3	74	1600	65	3801	85.5	63	74.8
Jordan	49	89	100	4.4	71	1650	66	4187	87.2	66	70.1
Kenya	50	53	77	4.6	58	320	55	1438	79.3	50	52.0
Korea	51	89	100	1.7	72	10610	82	11594	97.2	90	72.4
Lao PDR	52	39	19	5.7	67	400	50	2571	58.6	55	53.2
Lesotho	53	18	6	4.6	58	660	56	1290	82.3	56	56.0

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DATA FOR 106 SELECTED COUNTRIES : CONTINUED

Country	CC	SW	SAN	TFR	LE	PCY	GER	PPP	LIT	GER2	LE2
Madagascar	54	29	3	5.7	58	250	33	673	47.0	39	57.5
Malawi	55	45	53	6.5	43	180	67	773	57.7	75	39.3
Malayasia	56	88	91	3.4	72	4370	62	9572	85.7	65	72.6
Mali	57	37	31	6.7	50	240	17	56	35.5	25	53.3
Mauritius	58	98	100	2.1	71	3710	61	13294	83.0	63	71.4
Mexico	59	83	66	2.9	72	3670	66	6769	90.1	70	72.2
Morocco	60	52	40	3.3	66	1290	46	3477	45.9	49	66.6
Mozambique	61	32	21	6.1	45	80	25	959	40.5	25	45.2
Namibia	62	57	34	4.9	56	2250	84	4054	79.8	82	52.4
Nepal	63	48	20	5.0	57	210	55	1145	38.1	59	57.3
Netherland	64	100	100	1.5	77	25940	91	19876	99.0	98	77.9
Nicaragua	65	61	31	4.0	68	380	62	1837	63.4	63	67.9
Niger	66	53	15	7.4	47	200	15	765	14.3	15	48.5
Nigeria	67	39	36	5.4	53	240	50	1270	59.5	54	50.1
Norway	68	100	100	1.9	78	34510	92	22427	99.0	95	78.1
Oman	69	82	79	7.0	71	5200	60	9383	67.1	58	70.9
Pakistan	70	60	30	5.1	63	480	38	2209	40.9	43	64.0
Panama	71	83	87	2.6	74	3080	70	6258	91.1	73	73.6
PNG	72	28	22	4.7	58	1150	38	2500	73.7	37	57.9
Paraguay	73	42	30	3.9	71	1850	62	3583	92.4	64	69.6
Peru	74	60	44	3.1	68	2420	81	3940	88.7	78	68.3
Philippines	75	86	77	3.6	66	1160	78	2762	94.6	82	68.3
Poland	76	100	100	1.6	72	3230	79	5442	99.0	77	72.5
Portugal	77	100	100	1.4	75	10160	81	12674	90.8	91	75.3
Romania	78	100	49	1.3	69	1600	66	4431	97.8	68	69.9
S. Arabia	79	93	86	6.2	70	7050	56	8516	73.4	56	71.4
Senegal	80	50	58	5.7	50	570	31	1815	34.6	35	52.3
Sierra Leone	81	34	11	6.5	37	200	28	625	33.3	30	37.2
Singapore	82	100	97	1.7	76	30550	72	22604	91.4	73	77.1
S. Africa	83	70	46	2.9	65	3520	81	4334	84.0	93	54.7

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DATA FOR 106 SELECTED COUNTRIES : CONTINUED

Country	CC	SW	SAN	TFR	LE	PCY	GER	PPP	LIT	GER2	LE2
Spain	84	99	100	1.2	77	14350	90	14789	97.2	92	78.0
Sri Lanka	85	57	63	2.3	73	740	66	3408	90.7	66	73.1
Sudan	86	50	22	4.7	54	300	31	1110	53.3	34	55.0
Sweden	87	100	100	1.7	79	25710	82	19297	99.0	100	78.5
Switzerland	88	100	100	1.5	78	44350	76	24881	99.0	79	78.6
Syrian Arab Republic	89	85	78	4.0	69	1160	64	5374	71.6	33	47.9
Tanzania	90	49	86	5.6	50	170	34	636	71.6	33	47.9
Thailand	91	81	70	1.8	69	2960	53	7742	94.7	59	68.8
Togo	92	63	22	6.2	50	300	50	1167	53.2	61	48.8
Trinidad & Tobago	93	82	56	2.1	73	3870	67	9437	97.8	66	73.8
Tunisia	94	98	80	2.8	70	1930	67	5261	67.0	70	69.5
Turkey	95	92	94	2.6	69	2830	63	5516	83.2	61	67.0
Uganda	96	34	57	6.7	43	300	34	1483	64.0	40	39.6
Ukraine	97	97	49	1.3	67	1200	76	2261	99.0	100	77.2
UAE	98	98	95	3.5	75	17400	82	18008	74.8	69	74.8
UK	99	100	96	1.7	77	19600	86	19302	99.0	100	77.2
USA	100	90	85	2.1	77	28020	96	26977	99.0	94	76.7
Uruguay	101	83	82	2.2	74	5760	75	6854	97.5	77	73.9
Venezuela	102	79	58	3.0	73	3020	68	8090	92.0	67	72.4
Vietnam	103	36	21	3.0	68	290	55	1236	91.9	62	67.4
Yemen	104	52	51	7.2	54	380	52	856	42.5	49	58.0
Zambia	105	43	23	5.8	44	360	48	986	75.1	49	40.1
Zimbabwe	106	74	58	3.9	56	610	68	2135	90.9	68	44.1

CC=Country Code, SW=Access to Safe Drinking Water (%, 1995), SAN=Access to Sanitation (%, 1995), TFR=Total Fertility Rate (1995), LE=Life Expectancy (1995), PCY= GNP per Capita (US$, 1996), GER=Gross Enrollment Ratio at all Levels (%, 1995), PPP=Real GDP Per Capita (PPP$, 1995), LIT=Adult Literacy Rate (1997), GER2=Gross Enrollment Ratio at all Levels (%, 1997), LE2= Life Expectancy (1997)

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APPENDIX 2

DATA FOR 74 SELECTED DEVELOPING COUNTRIES

Country	CC	DCS	TFR	LE	GER	PCY	SAN	SW	PEEDU	PEH	PPPD	LFPR	FD
Chil e	1	2713	2.5	75.1	73	4160	83	86	2.9	2.5	108	39	129.3
Costa Rica	2	2855	3.1	76.6	69	2610	84	96	4.5	6.3	126	39	130.2
Argentina	3	3097	2.7	72.6	79	8030	89	64	4.5	4.3	268	39	119.8
Uruguay	4	2813	2.3	72.7	76	5170	82	83	2.8	2.0	309	45	127.7
Trindad & Tobago	5	2550	2.2	73.1	65	3770	56	82	4.5	2.6	90	40	109.8
Panama	6	2462	2.8	73.4	72	2750	87	83	5.2	5.4	119	39	101.7
Mexico	7	3116	2.9	72.1	67	3320	66	83	5.3	2.8	107	40	117.3
Columbia	8	2749	2.8	70.3	69	1910	63	76	3.5	3.0	105	40	112.9
Brazil	9	2824	2.3	66.6	72	3640	41	72	3.6	2.7	134	45	121.7
Ecuador	10	2420	3.3	69.5	71	1390	64	70	3.4	2.1	120	37	142.0
Jamaica	11	2615	2.5	74.1	67	1510	74	70	8.2	3.0	57	50	119.1
Peru	12	2147	3.2	67.7	79	2310	44	60	3.8	2.6	73	36	133.5
Dominican Republic	13	2308	3.0	70.3	73	1460	78	71	1.9	2.0	77	42	108.8
Paraguay	14	2552	4.4	69.1	63	1690	30	60	2.9	1.0	67	38	114.0
Guatemala	15	2298	5.1	66.1	46	1340	66	60	1.7	1.6	90	35	118.2
El Salvador	16	2571	3.3	69.4	58	1610	68	55	2.2	2.6	91	38	109.9
Bolivia	17	2189	4.6	60.5	69	800	44	60	6.6	2.4	51	40	125.3
Hondurus	18	2358	4.6	68.8	60	600	62	65	3.9	2.8	22	34	116.1
Nicaragua	19	2308	4.1	67.5	64	380	31	61	3.4	4.3	82	36	124.4
Mauritius	20	2886	2.3	70.9	61	3380	100	98	4.3	2.2	85	41	110.0
Algeria	21	3035	4.1	68.1	66	1600	91	78	7.8	3.3	83	30	132.7
Tunisaia	22	3173	3.1	68.7	69	1820	80	98	6.8	3.0	67	36	135.8
S.Africa	23	2865	4.5	64.1	81	3160	46	70	6.8	3.6	59	39	103.9
Botswana	24	2140	4.7	51.7	71	3020	55	70	9.6	1.9	44	44	93.5
Namibia	25	2093	5.1	55.8	83	2000	34	57	9.4	0.9	23	41	118.3
Egypt	26	3315	3.6	64.8	69	790	11	64	5.6	1.2	202	39	131.1
Swaziland	27	2660	4.7	58.8	77	1170	70	60	8.1	2.7	11	32	97.9
Gabon	28	2443	5.2	54.5	60	3490	76	67	2.7	0.6	47	47	107.7
Morocco	29	3140	3.4	65.7	48	1100	40	52	5.6	1.6	34	39	113.7
Congo	30	2083	6.1	51.2	68	680	9	47	5.9	2.8	27	40	115.8
Zimbabwe	31	1915	4.9	48.9	69	540	58	74	8.5	2.0	14	47	106.0
Cameroon	32	2199	5.5	55.3	45	650	40	41	3.2	1.0	7	40	122.6
Ghana	33	2574	5.5	57.0	44	390	27	56	3.1	1.3	4	47	152.0
Lesotho	34	1965	5.0	58.1	56	770	6	52	5.9	3.5	5	42	119.1
Kenya	35	1980	5.1	53.8	52	280	77	53	7.4	1.9	15	50	104.9

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DATA FOR 74 DEVELOPING COUNTRIES : CONTINUED

Country	CC	DCS	TFR	LE	GER	PCY	SAN	SW	PEEDU	PEH	PPPD	LFPR	FD
Comoros	36	1794	5.8	56.5	39	470	23	55	3.9	3.3	10	57	111.4
Nigeria	37	2497	6.2	51.4	49	260	36	39	6.4	0.3	21	40	139.9
Togo	38	1736	6.3	50.5	60	310	22	55	5.6	1.7	6	42	133.0
Benin	39	2386	6.1	54.4	38	370	20	50	3.1	1.7	6	45	130.4
Zambia	40	1915	5.7	42.7	52	400	23	43	1.8	2.4	10	47	108.8
Mauritania	41	2568	5.2	52.5	38	460	74	32	5.0	1.8	11	46	107.2
Tanzania	42	2003	5.7	50..6	33	120	86	49	4.4	3.0	4	51	102.2
Madagascar	43	1996	5.9	57.6	31	230	3	29	4.4	1.1	24	52	105.7
Central African Republic	44	1877	5.1	48.4	27	340	23	18	2.8	1.9	6	48	130.2
Angola	45	1904	6.9	47.4	30	410	16	32	5.1	4.0	0	47	133.5
Senegal	46	2365	5.8	50.3	33	600	86	93	3.6	2.5	7	44	103.8
Uganda	47	2249	7.1	40.5	38	240	57	34	1.2	1.6	4	55	103.2
Chad	48	1917	5.7	47.2	27	180	21	24	2.2	3.4	2	48	114.8
Guniea Bissau	49	2423	5.6	43.4	29	250	20	23	3.2	1.1	18	48	108.6
Gambia	50	2122	5.4	46.0	39	320	37	76	5.5	1.9	2	49	73.1
Mozambique	51	1675	6.3	46.3	25	80	21	32	4.4	4.6	0	54	121.9
Burundi	52	1741	6.5	44.5	23	160	51	52	2.8	0.9	6	54	97.2
Mali	53	2137	6.9	47.0	18	250	31	37	2.2	2.0	4	54	115.6
Burkina Faso	54	2248	6.8	46.3	19	230	18	78	3.6	2.3	0	52	125.4
Niger	55	2135	7.3	47.5	15	220	15	53	3.1	1.6	3	49	123.1
Sierra Leone	56	1992	6.3	34.7	30	180	11	34	3.8	1.6	10	37	96.3
Malawi	57	2026	6.5	43.0	67	180	53	45	5.5	2.3	2	53	110.4
Ethiopia	58	1845	7.0	49.0	18	100	10	27	4.0	1.7	4	43	128.2
UAE	59	3329	3.6	74.4	69	17400	95	98	1.8	2.0	168	49	184.7
Malaysia	60	2765	3.4	71.4	61	3890	91	88	5.3	1.4	43	40	127.0
Lebanon	61	3269	2.9	69.3	75	2660	63	94	2.0	2.1	191	33	116.9
S. Arabia	62	2736	6.1	70.7	57	7040	86	93	5.5	3.1	166	33	97.4
Jordan	63	2726	5.4	68.9	66	1510	100	89	6.3	3.7	158	35	171.8
Indonesia	64	2699	2.8	64.0	62	980	51	62	1.7	0.7	12	47	124.3
Philippines	65	2319	3.8	67.4	80	1050	75	70	2.2	1.3	41	40	124.4
Mongolia	66	1895	3.4	64.8	53	310	86	80	5.6	4.8	268	49	83.1

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DATA FOR 74 DEVELOPING COUNTRIES : CONTINUED

Country	CC	DCS	TFR	LE	GER	PCY	SAN	SW	PEEDU	PEH	PPPD	LFPR	FD
Vietnam	67	2438	3.2	66.4	55	240	21	36	2.7	1.1	40	51	134.5
Lao PDR	68	2105	6.7	52.2	50	350	19	39	2.4	1.3	20	49	.
Pakistan	69	2471	5.3	62.8	41	460	30	60	2.0	0.8	52	38	130.7
India	70	2382	3.2	61.6	55	340	29	81	3.5	0.7	48	43	118.8
Bangladesh	71	2001	3.3	56.9	37	240	35	79	2.3	1.2	18	50	110.0
Yemen	72	2013	7.6	56.7	49	260	51	52	7.5	1.2	26	28	112.1
Nepal	73	2367	5.2	55.9	56	200	20	48	2.9	1.2	5	48	115.1
Sri Lanka	74	2302	2.2	72.5	67	700	63	57	3.1	1.4	23	42	105.8

CC =Country code, DCS= Daily Calorie Supply Per Capita , TFR=Total Fertility Rate , LE= Life expectancy (years)
GER= Gross enrollment ratio at all levels (%), PCY= GNP Per Capita (US$), SAN= Access to Proper Sanitation (%) ,
SW=Access to Safe Drinking Water (%), PEEDU= Public Expenditure on Education (as % of GNP) , PEH= Public Expenditure on Health (as %of GNP), PPPD= Physian per Thousand Population, LFPR=Labour Participation Rate (%) , FD =Food Production ,

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APPENDIX I

DATA FOR 64 DISTRICTS OF BANGLADESH

DISTRICT	LIT	CAL	PCY	LAND	FFD	SAN3	SAN4	ELEC	LIT 2	AGR	BUSI	EMPL	IMR	LE	TFR
Barisal	53.89	2193.12	3486.75	3.21	2101.49	51.90	3.01	85.57	9.86	37.94	17.15	12.13	73	60.3	3.47
Barguna	48.33	2158.23	3770.18	3.40	1912.10	55.80	11.00	83.60	9.67	54.10	18.65	5.29	68	59.2	3.41
Bhola	41.24	2228.74	3647.35	6.20	2086.95	56.40	18.40	90.20	8.45	44.80	16.73	4.18	69	59.2	3.32
Jhalokhati	63.40	2296.65	2981.86	0.40	1971.44	58.00	7.60	91.80	11.29	42.07	14.37	10.37	69	60.1	3.37
Patuakhali	49.58	2273.79	3769.62	6.00	2106.52	49.60	16.60	86.00	12.77	49.81	15.19	7.59	82	56.2	3.49
Pirojpur	65.16	2277.16	3155.05	2.00	1945.58	45.40	9.00	87.00	10.12	41.99	18.51	7.00	79	57.9	3.48
Bandarban	34.37	1959.18	3527.70	7.80	1755.68	55.20	23.00	85.00	7.29	59.04	10.85	3.97	85	56.5	3.50
B.Baria	35.46	2003.79	3118.02	2.99	1950.35	66.47	15.77	87.43	3.91	48.56	18.06	3.03	81	56.3	3.49
Chandpur	43.29	2036.11	4547.46	3.20	2213.13	54.80	5.80	75.60	12.50	32.33	25.21	13.97	74	60.2	3.58
Chittagong	46.45	2136.96	4387.67	18.60	2389.39	57.20	8.40	58.40	14.01	18.28	16.92	24.56	88	57.3	3.62
Comilla	51.54	2155.04	3688.20	0.60	2100.40	48.60	14.80	65.20	14.23	41.98	20.58	11.39	70	60.4	3.34
C.Bazar	39.34	2413.76	5399.00	4.40	2808.40	46.00	28.60	83.60	7.11	43.70	20.64	6.37	59	61.4	3.36
Feni	51.10	2111.80	4294.78	4.20	2074.77	43.40	9.20	69.00	13.45	40.83	18.79	15.98	79	56.8	3.75
Khagrach	35.18	2266.96	3539.14	19.20	1892.80	65.20	21.00	88.00	4.46	51.03	9.60	2.61	76	56.7	3.72
Laxmipur	46.88	1969.62	3744.46	0.80	2157.81	69.20	12.80	80.40	9.54	50.08	17.70	9.54	75	56.6	3.71
Noakhali	46.53	2074.19	3841.14	1.60	2128.19	72.75	2.40	75.95	7.59	49.17	13.47	9.86	89	55.9	3.70
Rangamati	41.62	2184.15	4053.18	5.60	2301.75	70.00	10.20	79.60	9.72	66.23	8.55	5.46	85	56.2	3.75
Dhaka	57.49	2208.21	6685.96	35.60	2640.87	36.80	0.20	31.20	22.20	11.81	25.04	23.91	72	59.8	3.52
Faridpur	44.02	2127.59	3533.35	0.80	1781.34	72.20	7.40	87.20	8.66	50.88	13.82	7.79	78	57.2	3.37
Gazipur	43.76	2148.27	3438.51	13.80	1780.32	52.80	19.00	89.00	8.86	49.37	11.71	13.82	58	61.3	3.42
Gopalganj	53.53	2207.29	4574.84	1.20	2158.03	61.80	11.60	87.60	12.06	52.25	22.69	5.41	79	58.7	3.41
Jamalpur	28.93	1953.20	2964.35	13.60	1436.57	50.00	36.80	87.60	6.91	64.43	9.56	3.76	67	58.2	3.47
Kishoregan	40.78	2456.18	4984.79	2.60	2235.78	51.20	31.80	85.20	8.98	64.12	14.77	7.64	78	56.8	3.67
Madaripur	38.38	2188.75	3771.93	3.00	1963.02	70.40	7.40	80.20	11.59	49.44	15.14	6.11	83	55.2	3.75
Manikganj	38.61	2094.18	3700.60	6.80	1874.89	73.80	9.00	86.00	8.59	55.74	15.31	8.67	52	60.9	3.40
Munshiganj	50.99	2160.56	5552.01	9.40	2262.02	62.40	13.00	61.40	10.30	43.37	25.73	13.00	54	60.4	3.28
Mymenshing	41.63	1903.12	3072.64	4.80	1653.93	35.20	49.40	83.20	10.89	62.78	17.89	4.47	63	59.3	3.35
Narayanganj	49.66	2163.96	4745.68	24.80	2227.97	50.00	9.40	37.60	11.92	17.82	19.03	24.02	64	59.4	3.15
Narshindi	39.62	2290.76	4062.54	3.00	2099.21	32.60	37.80	76.00	7.31	44.26	15.30	10.25	64	55.4	3.62
Netrokona	39.58	2127.08	3295.73	8.60	1847.23	61.80	25.60	83.60	7.85	74.28	8.97	4.75	75	58.8	3.60
Rajbari	34.78	2079.10	3898.18	7.60	1845.85	61.20	18.00	87.80	8.65	69.06	11.34	3.22	72	59.0	3.62
Shariatpur	36.61	2157.23	4081.09	7.00	2211.46	68.80	13.80	92.60	6.91	61.53	12.31	8.29	92	56.2	3.72
Sherpur	31.81	1930.02	2898.13	5.80	1486.69	63.40	17.00	89.60	7.14	68.13	9.38	4.53	70	58.7	3.65
Tangail	39.91	1872.85	4690.62	8.40	1348.17	52.20	23.20	78.20	9.94	57.28	14.24	9.06	68	59.9	3.40
Khulna	54.66	2046.21	3416.99	14.40	1775.39	53.40	1.80	80.00	12.64	39.35	21.30	8.95	77	57.2	3.40

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DATA FOR 64 DISTRICTS OF BANGLADESH: CONTINUED

Country	LIT	CAL	PCY	LAND	FFD	SAN3	SAN4	ELEC	LIT2	AGR	BUSI	EMPL	IMR	LE	TFR
Bagerhat	53.79	1818.23	3143.77	5.59	2146.02	61.28	3.79	80.44	9.76	48.78	18.08	8.61	75	57.2	3.32
Chuadanga	42.16	2225.53	3749.76	2.60	1790.77	49.40	29.40	73.20	10.41	59.02	16.02	5.05	67	60.5	3.47
Jessore	48.08	2180.11	3837.73	6.40	1850.05	36.20	33.80	69.20	9.47	57.79	14.07	9.73	58	57.2	3.18
Jhenaidah	42.41	2076.67	3714.52	3.20	1732.71	34.60	41.80	85.60	8.67	62.19	14.00	4.62	78	57.3	3.85
Kushtia	35.14	2184.81	3493.75	7.40	1713.21	47.40	35.00	79.40	7.35	53.58	19.42	3.94	77	57.9	3.65
Magura	39.26	2059.84	3503.76	2.20	1776.72	51.00	28.00	85.80	10.26	60.97	17.90	5.38	73	57.8	3.57
Meherpur	35.31	2182.61	3446.80	4.40	1658.89	39.40	40.00	74.80	6.92	66.97	16.22	4.05	70	58.0	3.17
Narail	47.82	2166.50	3679.61	4.80	1951.42	60.60	15.00	89.20	10.23	60.77	9.36	7.73	71	59.2	3.35
Satkhira	47.29	2052.32	3735.03	2.60	1763.79	55.00	19.60	84.00	8.37	52.66	12.81	5.63	69	59.6	3.40
Bogra	40.57	2061.65	5823.94	5.60	1997.62	24.00	43.00	73.60	11.88	41.98	20.24	10.79	70	59.7	3.95
Dinajpur	39.96	2469.24	3722.20	9.00	1785.48	13.00	70.40	78.20	12.78	63.45	13.67	4.90	71	58.9	3.34
Gaibandha	36.63	2240.51	3040.35	5.20	1586.19	15.00	68.60	85.60	10.55	68.00	15.56	4.44	71	59.2	3.58
Joypurhat	37.26	2352.74	3447.32	4.60	1741.17	12.80	73.40	79.00	8.60	73.94	10.76	5.61	74	56.8	3.85
Kurigram	30.08	2168.21	2355.76	3.20	1472.55	35.20	50.60	95.60	8.65	73.85	8.19	4.31	66	59.3	3.47
Lalmonirhat	40..09	1985.07	2790.76	9.80	1447.63	17.00	58.20	93.40	7.27	69.83	8.78	4.25	70	59.8	3.32
Naogaon	42.04	2323.41	4233.08	2.80	1811.25	18.20	59.20	79.20	12.68	60.65	16.01	7.78	72	59.7	3.59
Natore	39.58	2097.62	3508.38	3.00	1625.11	53.00	26.20	74.00	6.76	68.33	9.03	4.86	53	61.2	3.38
Nawabganj	27.91	2260.66	3106.51	2.20	1763.52	30.40	58.40	89.40	6.32	51.60	18.61	5.96	66	60.1	3.40
Nilphamari	30.72	2234.31	3166.20	14.20	1593.61	6.60	74.80	86.60	5.05	64.05	9.47	2.66	74	58.2	3.62
Pabna	34.68	2305.35	4014.28	7.40	2028.39	55.60	14.00	81.00	9.95	50.47	13.26	9.34	68	59.7	3.48
Panchagar	39.12	2145.99	2733.20	20.20	1576.26	18.20	58.00	93.40	6.69	70.71	7.24	3.15	54	60.1	3.32
Rajshahi	41.63	2090.72	3332.33	0.00	1772.27	24.40	55.60	78.80	9.75	59.19	16.41	5.57	65	59.3	3.45
Rangpur	33.18	2013.66	2394.57	15.00	1294.34	17.60	71.00	83.40	6.37	55.56	8.59	3.70	70	59.7	3.56
Sirajganj	30.74	2146.88	2934.91	3.00	1794.90	76.60	10.60	87.80	8.24	55.23	11.63	5.96	67	60.2	3.34
Thakurgaon	35.80	2134.48	3086.61	8.40	1555.02	64.35	11.05	88.40	6.17	77.82	6.56	2.79	68	59.8	3.12
Habiganj	39.56	2335.58	3802.06	13.80	2326.29	63.40	9.80	68.00	10.6	50.13	16.54	14.36	71	59.8	3.41
Maulavibazar	42.55	2262.77	4375.73	10.22	2402.28	65.54	11.42	77.56	7.57	45.57	16.31	7.87	69	60.4	3.40
Sunamganj	32.03	2373.40	4200.74	11.40	2392.67	61.80	16.40	84.40	6.53	60.02	14.27	3.44	65	59.7	3.41
Sylhet	38.11	2108.96	5042.45	10.98	2525.37	66.67	6.59	77.84	5.03	59.51	8.17	5.37	67	59.8	3.82

LIT= Distribution of Literacy Rate of Population (7 years and above), CAL= Per Capita Per Day Calorie Intake, PCY = Per Capita Income (Taka), LAND=% Distribution of Households by Land Ownership (Landless), FFD=Distribution of Monthly Expenditure on Major Food Item Per Household (Total), SAN3=% Distribution of Households by Type of Toilet (Kuncha), SAN4=% Distribution of Households by Type of Toilet (Open Field), ELEC=% Distribution of Households by Electric Supply, LIT2=% Literate Persons (SSC and Above) among Population (7 Years and Above), AGR = % Distribution of Population by Type of Works (Agriculture), BUSI=% Distribution of Population by Type of Works (Business), EMPL= % Distrbution of Population by Type of Works (Non Govt. Employee), IMR = Infant Mortality Rate, LE = Life Expectancy, TFR= Total Fertility Rate